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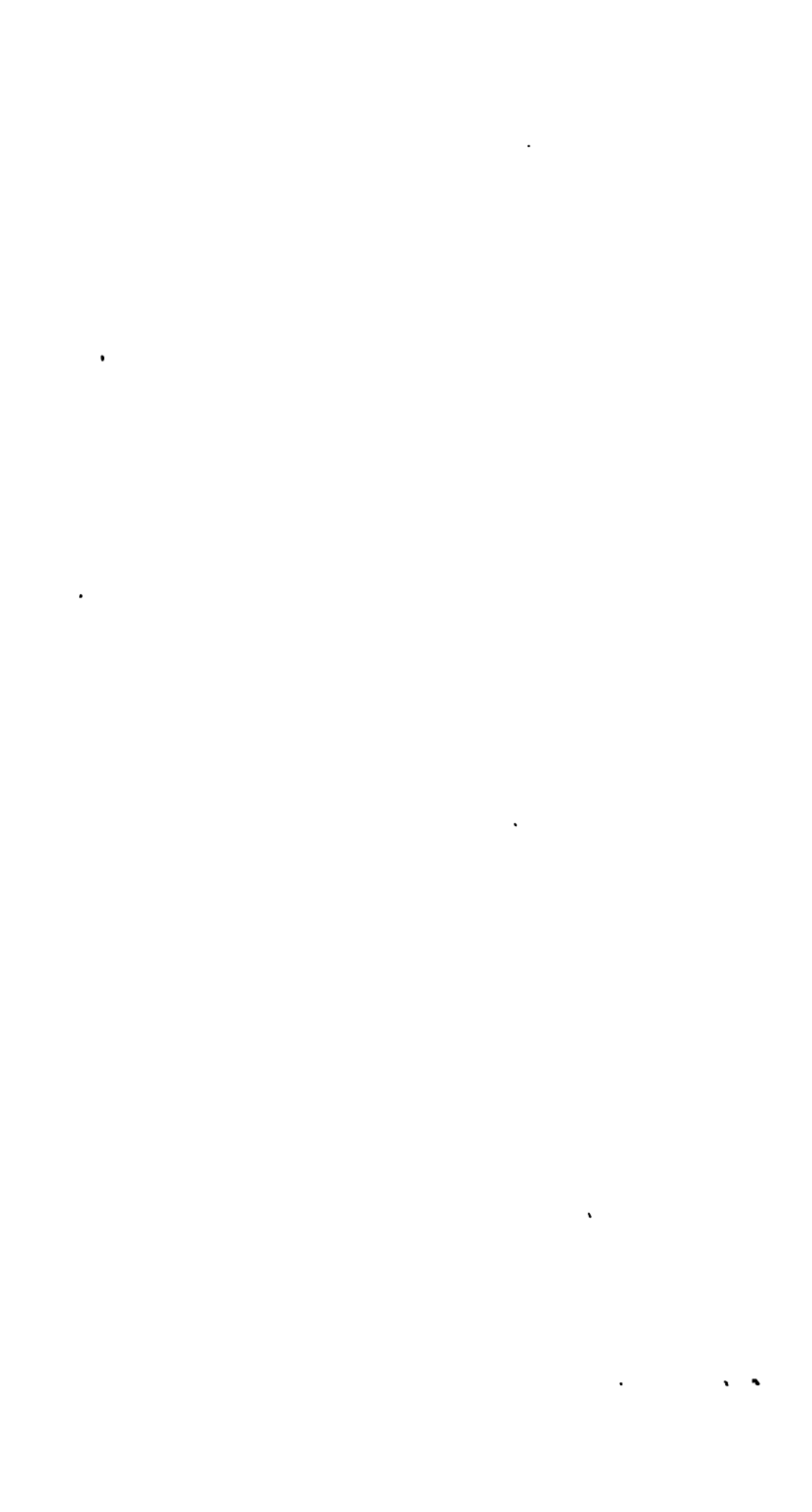
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**EVERY**  
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**MAN HIS OWN TEACHER** *Peru*

BEING AN

**INTRODUCTION TO ARITHMETIC,**

WHEREBY PERSONS WHO ARE IGNORANT OF  
THAT SCIENCE, MAY OF THEMSELVES,  
WITHOUT A TEACHER, OBTAIN  
A SUFFICIENT DEGREE  
OF KNOWLEDGE IN  
FIGURES,

**FOR COMMON BUSINESS,**

**AND FOR OPERATING IN NEARLY ALL  
THE BOOKS EXTANT ON THAT  
SUBJECT.**

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BY JOHN PRESTON, *Philo. Math.*

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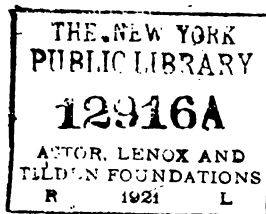
SECOND EDITION—WITH ADDITIONS.



*ALBANY.*

PRINTED BY G. J. LOOMIS,  
9 Washington-street.

.....  
**1834.**



NORTHERN DISTRICT OF NEW-YORK, to wit:

BE IT REMEMBERED, That on the sixth day of April, Anno Domini, eighteen hundred and thirty-three, JOHN PRESTON, of the said district, hath deposited in this office the title of a book, the title of which is in the words following, to wit: "EVERY MAN HIS OWN TEACHER," being an introduction to Arithmetic, whereby persons who are ignorant of that science, may of themselves, without a teacher, obtain a sufficient degree of knowledge in figures, for common business, and for operating in nearly all of the books extant on that subject, by JOHN PRESTON, Philo. Math., the right whereof he claims as author and proprietor.

In conformity with an act of Congress, entitled an Act to amend the several Acts respecting copy rights.

RUTGER B. MILLER,  
Clerk of the Northern District of New-York.

## DEDICATION.

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CITY OF ALBANY, JANUARY 1st. 1834.

To the Hon. Stephen Van Rensselaer, Proprietor of the Manor of Rensselaerwick,—one of the Regents of the University of the State of New-York, &c.

SIR:—The first edition of this work was, by permission, inscribed to the patriotic De Witt Clinton, deceased, then Governor of this State, in words following: “Having a knowledge of your efforts and zeal in promoting the useful arts and sciences—and at a time when they are needful for the continuance and prosperity of free governments; when *pretensions to political good*, are too often substituted for *real patriotism*; I venture to inscribe to you this work, introductory to the different systems of arithmetic, for perusal and approbation.

Hoping at the same time, that your labors, together with the influence of other gentlemen, who are friendly to the education of youth, and the equal rights of man, will be so far blessed, as shall cause the rising generations to know and practise those precepts which will not only benefit a few, but such as will augment the interest, the prosperity, and the happiness of all.”

Having thus dedicated the first edition to one of our former statesmen and PATRIOTS, I now also beg leave to inscribe this second edition to yourself, as a

testimonial of your liberality and munificent aid bestowed on the poor ; together with the encouragements from time to time afforded for the promulgation of the arts and sciences : hoping that honorable, wealthy, and liberal individuals, may in future times, take an example from your benevolence for the aid of the rising youth of our country, "in teaching the young IDEA how to shoot."

Respectfully submitted,  
By the Author.

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### MONITION FOR YOUTH.

" The youth who's led by wisdom's guiding hand,  
Seeks virtue's temple and her law reveres,  
He,—he alone in honor's dome shall stand,  
Crown'd with rewards, and rais'd above his peers :  
Recording annals will preserve his name,  
And give his virtues to IMMORTAL FAME !"

*Watts.*

*Thus may some have it in their pow'r,*  
" Th' applause of list'ning Senates to command,  
The threats of pain and ruin to despise,  
To scatter plenty o'er a smiling land,  
And read their *hist'ry* in a NATIONS' EYES."

## DIRECTIONS FOR TEACHING BY THIS BOOK.

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1. Each scholar must have a slate and pencil: Slates without a frame will answer the purpose.

2. Benches ought to be four feet in length, with a space of eighteen inches vacancy at each end; place two scholars on each bench; they can then move in and out without disturbing each other.

3. The desk part must be level: all writing desks are too slanting: a position of three degrees elevation is sufficient for accounting houses.

4. On the front part of each tier of benches, raise a partition three feet in height; this will furnish the scholars with a place for hanging their lessons before them, and prevent detrimental communication. There must also be a space behind the scholars for an overseer with a slate and pencil, to each class. This is necessary in reading and writing, as well as in arithmetic. The first lesson for a child is to form the Roman alphabet in capitals, then the Italic alphabet; this operation can be done on a black board covered with white sand, or on a slate: begin with I, then H, L, l, i, E, F; these will comprise the letters which are formed with straight marks and right angles in Roman print. In the next place begin with those letters which have acute angles, and finish with those letters

A\*



which have a circular construction, together with all the small letters discreetly divided into sections.

5. Behind each class, place an overseer with a slate and pencil as before mentioned :—a boy or girl at the age of ten years, who has previously learned the lessons, is sufficiently able to oversee ; and at the same time they will be improving and growing more expert in calculations, or in reading.

6. When one scholar becomes more ready in calculation than the rest, examine the class in the manner prescribed on card No. 16, and advance those who are suitable for a higher class, as discretion may dictate the teacher.

This plan is intended for exciting a laudable ambition, for an encouragement to persevere in study, and obtain a higher grade than to remain stationary.

Repetitions will often happen in this work to save time in turning over to particular rules, and to render the work easy.

The following directions are a sample of Repetition : The *cards* and all the *tables* must be copied in a neat copy-hand, properly called Roman text ; they must then be pasted on boards, press-paper, or old newspapers of a two-fold thickness : in the next place suspend these cards and tables in plain view, for each scholar to look at when time and business will permit ; but at the time of examination, the blank side must be turned to view. In common schools it will answer a valuable purpose to examine the pupils immediately after the class has finished a lesson in reading.

## † EXAMPLES.\*

How many *pounds* in a *quarter* of a hundred avoirdupois? How many *pounds* in a *hundred* avoirdupois? How many *ounces* in a *pound* of the same weight? How many *ounces* in a *pound* troy weight? How many *rods* in a *furlong*? How many *feet* in a *rod*? How many *feet* in a *yard*? How many *inches* in a *foot*? How many are 7 times 8? 8 times 9? 8 times 8? 6 times 7? 5 times 9? 11 times 2? 11 times 5? 9 times 11? 10 times 11? 6 times 5? &c. &c. according to the ingenuity of the teacher.

In this mode of interrogating, give preference as in spelling; it will create a profitable rivalry, and furnish the mind with a little fund of mental calculation. All the tables ought to be attended to, especially the Addition No. 1, and the Multiplication.

## † EXPLANATION OF ARITHMETIC.

Arithmetic is the science of numbers: by it we can make greater calculations with figures, than by the mind alone. Arithmetic may be divided into three parts: *common*, *vulgar*, *decimal*. *Common* arithmetic is that part by which we usually transact business; *vulgar* is, in some cases, a short method of making calculations by vulgar fractions; *decimal* arithmetic is an easy mode of calculating by whole numbers and

\* Additional lessons to the first edition, now inserted in this second edition are marked with a dagger, thus †.

fractions combined. These fractions are composed of tenths, hundredths, thousandths, tens of thousandths, hundreds of thousandths, &c.

Whole numbers are called *Integers* ; and fractions are parts of integers, as will be explained in their proper place. To arithmetic belong six rules:—*notation, numeration, addition, subtraction, multiplication, and division* ; the four last of these are called the *ground rules*, by which all calculations are made. Their explanation will be found in each rule.

### † QUESTIONS.

What is arithmetic?

Into how many parts may we divide it?

What are their names?

What is common arithmetic?

What is vulgar?

What is decimal?

What are whole numbers called?

What are fractions?

How many ground rules in arithmetic?

Name them.

### † NOTATION AND NUMERATION.

Notation is the noting down any number, as 1234. Numeration shows how to read such number, or any number we please. Begin with the 4; and read to the left hand:—units, tens, hundreds, thousands; one thousand, two hundred and thirty-four.

Now attend to your numeration table, card No. 7. Let it be written in large hand writing,—hang it in view and copy it on your slates repeatedly.

## CARD NO. 1.

*Formation of Numbers.*

1 2 3 4 5 6 7 8 9, these are called the nine digits, and this 0, cipher: the following numbers show their formation and meaning.

1 one	2 two
3 three	4 four
5 five	6 six
7 seven	8 eight
9 nine	10 ten
11 eleven	12 twelve
13 thirteen	14 fourteen
15 fifteen	16 sixteen
17 seventeen	18 eighteen
19 nineteen	20 twenty
21 twenty-one	22 twenty-two
23 twenty-three	24 twenty-four
25 twenty-five	26 twenty-six
27 twenty-seven	28 twenty-eight
29 twenty-nine	30 thirty
31 thirty-one	32 thirty-two
33 thirty-three	34 thirty-four
35 thirty-five	36 thirty-six
37 thirty-seven	38 thirty-eight
39 thirty-nine	40 forty
41 forty-one	42 forty-two
43 forty-three	44 forty-four
45 forty-five	46 forty-six
47 forty-seven	48 forty-eight

49 forty-nine	50 fifty
51 fifty-one	52 fifty-two
53 fifty-three	54 fifty-four
55 fifty-five	56 fifty-six
57 fifty-seven	58 fifty-eight
59 fifty-nine	60 sixty
61 sixty-one	62 sixty-two
63 sixty-three	64 sixty-four
65 sixty-five	66 sixty-six
67 sixty-seven	68 sixty-eight
69 sixty-nine	

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**CARD NO. 2.***Formation of Numbers.*

70 seventy	71 seventy-one
72 seventy-two	73 seventy-three
74 seventy-four	75 seventy-five
76 seventy-six	77 seventy-seven
78 seventy-eight	79 seventy-nine
80 eighty	81 eighty-one
82 eighty-two	83 eighty-three
84 eighty-four	85 eighty-five
86 eighty-six	87 eighty-seven
88 eighty-eight	89 eighty-nine
90 ninety	91 ninety-one
92 ninety-two	93 ninety-three
94 ninety-four	95 ninety-five
96 ninety-six	97 ninety-seven
98 ninety-eight	99 ninety-nine

100 one hundred  
 101 one hundred and one  
 108 one hundred and eight  
 109 one hundred and nine  
 110 one hundred and ten  
 111 one hundred and eleven  
 113 one hundred and thirteen  
 117 one hundred and seventeen  
 120 one hundred and twenty  
 201 two hundred and one  
 204 two hundred and four  
 209 two hundred and nine  
 302 three hundred and two  
 404 four hundred and four  
 406 four hundred and six  
 607 six hundred and seven  
 1001 one thousand and one  
 1002 one thousand and two  
 Dollars are noted thus, \$1002

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### + SIMPLE ADDITION,

Is a Rule by which we find the amount, or sum total, of several objects put, or combined together. For example :—say 4 apples more 2, equal 6 ; 4 more 6 equal 10 ; 4 more 2 more 6, more 5, more 3, equal 20 : or in a mathematical mode of expression,  $4+2+6+5+3=20$ . For the word *more*, we use this mark +, and for the word *equal*, we make use of two parallel lines, thus =. That is to say :—4 more 2, more 6, more 5, more 3, equal 20. See card No. 26 for a full explanation.

## QUESTIONS.

What is the use of Addition ?

By what sign shall we know Addition ?

What is the sign of *equality*, or of the word *equal* ?

Mark them on your slate.

## CARD No. 3.

*Combination of Numbers.*

2 and 2 are 4, 3 and 1 are 4, 4 and 2 are 6, 5 and 1 are 6, 6 and 1 are 7, 3 and 2 are 5, 5 and 2 are 7, 6 and 2 are 8, 7 and 2 are 9, 8 and 2 are 10, 9 and 2 are 11, 10 and 2 are 12, 11 and 2 are 13, 12 and 2 are 14, 13 and 2 are 15, 14 and 2 are 16, 15 and 2 are 17, 16 and 2 are 18, 17 and 2 are 19, 18 and 2 are 20, 19 and 2 are 21, 4 and 3 are 7, 5 and 3 are 8, 6 and 3 are 9, 7 and 3 are 10, 8 and 3 are 11, 9 and 3 are 12, 10 and 3 are 13, 11 and 3 are 14, 12 and 3 are 15, 13 and 3 are 16, 14 and 3 are 17, 15 and 3 are 18, 16 and 3 are 19, 17 and 3 are 20.

18 and 3 are 21, 19 and 3 are 22, 20 and 3 are 23, 21 and 3 are 24, 22 and 3 are 25, 23 and 3 are 26, 24 and 3 are 27, 25 and 3 are 28, 26 and 3 are 29, 27 and 3 are 30, 28 and 3 are 31, 29 and 3 are 32, 30 and 3 are 33, 31 and 3 are 34, 32 and 3 are 35, 33 and 3 are 36, 34 and 3 are 37, 35 and 3 are 38, 36 and 3 are 39, 37 and 3 are 40, 38 and 3 are 41, 39 and 3 are 42, 40 and 3 are 43, 41 and 3 are 44, 42 and 3 are 45, 43 and 3 are 46, 44 and 3 are 47, 45 and 3 are 48, 46 and 3 are 49, 47 and 3 are 50, 48 and 3 are 51, 49 and 3 are 52, 50 and 3 are 53, 51 and 3 are 54, 52 and 3 are 55, 53 and 3 are 56, 54 and 3 are 57, 55 and 3 are 58, 56 and 3 are 59, 57 and 3 are 60, 58 and 3 are 61, 59 and 3 are 62, 60 and 3 are 63, 61 and 3 are 64, 62 and 3 are 65, 63 and 3 are 66, 64 and 3 are 67, 65 and 3 are 68, 66 and 3 are 69, 67 and 3 are 70, 68 and 3 are 71, 69 and 3 are 72, 70 and 3 are 73, 71 and 3 are 74, 72 and 3 are 75, 73 and 3 are 76, 74 and 3 are 77, 75 and 3 are 78, 76 and 3 are 79, 77 and 3 are 80, 78 and 3 are 81, 79 and 3 are 82, 80 and 3 are 83, 81 and 3 are 84, 82 and 3 are 85, 83 and 3 are 86, 84 and 3 are 87, 85 and 3 are 88, 86 and 3 are 89, 87 and 3 are 90, 88 and 3 are 91, 89 and 3 are 92, 90 and 3 are 93, 91 and 3 are 94, 92 and 3 are 95, 93 and 3 are 96, 94 and 3 are 97, 95 and 3 are 98, 96 and 3 are 99, 97 and 3 are 100.

After teaching how to form the Roman Alphabet, attend to the *Italic*; this will enable the scholars to write all their lessons, which is of the utmost importance.

## CARD No. 4.

*Combination of Numbers.*

9 and 1 are 10, and 1 are 11, and 1 are 12, and 2 are 14, and 2 are 16, and 2 are 18, and 2 are 20, and 2 are 22, and 2 are 24, and 2 are 26, and 2 are 28, and 2 are 30, and 2 are 32, and 2 are 34.

2 and 3 are 5, and 3 are 8, and 3 are 11, and 3 are 14, and 3 are 17, and 3 are 20, and 3 are 23, and 2 are 25, and 4 are 29, and 3 are 32, and 3 are 35, and 4 are 39, and 3 are 42, and 5 are 47, and 2 are 49.

9 and 3 are 12, and 3 are 15, and 3 are 18, and 3 are 21, and 4 are 25, and 2 are 27, and 3 are 30, and 1 are 31, and 5 are 36, and 4 are 40.

11 and 2 are 13, and 4 are 17, and 4 are 21, and 5 are 26, and 3 are 29, and 3 are 32, and 5 are 37, and 4 are 41, and 6 are 47, and 3 are 50.

4 and 6 are 10, and 4 are 14, and 5 are 19, and 2 are 21, and 5 are 26, and 3 are 29, and 3 are 32, and 4 are 36, and 4 are 40, and 9 are 49, and 4 are 53, and 4 are 57, and 4 are 61, and 9 are 70.

18 and 3 are 21, and 7 are 28, and 2 are 30, and 7 are 37, and 2 are 39, and 3 are 42, and 4 are 46, and 4 are 50, and 6 are 56, and 3 are 59, and 4 are 63, and 5 are 68, and 4 are 72, and 4 are 76.

37 and 3 are 40, and 6 are 46, and 3 are 49, and 4 are 53, and 4 are 57, and 4 are 61, and 6 are 67, and 5 are 72, and 6 are 78, and 3 are 81, and 2 are 83, and 1 are 84, and 5 are 89, and 2 are 91.

17 and 4 are 21, and 6 are 27, and 3 are 30, and 4 are 34, and 5 are 39.



## CARD No. 5.

*Combination of Numbers.*

11 and 6 are 17, and 7 are 24, and 5 are 29, and 4 are 33, and 4 are 37, and 5 are 42, and 3 are 45, and 4 are 49, and 6 are 55, and 6 are 61, and 7 are 68, and 2 are 70, and 6 are 76, and 3 are 79.

13 and 4 are 17, and 4 are 21, and 6 are 27, and 5 are 32, and 5 are 37, and 3 are 40, and 4 are 44, and 5 are 49, and 2 are 51, and 7 are 58, and 5 are 63, and 4 are 67, and 2 are 69, and 5 are 74.

8 and 7 are 15, and 4 are 19, and 5 are 24, and 3 are 27, and 4 are 31 and 9 are 40, and 1 are 41, and 7 are 48, and 5 are 53, and 6 are 59, and 5 are 64, and 3 are 67, and 4 are 71, and 5 are 76, and 5 are 81.

9 and 7 are 16, and 3 are 19, and 9 are 28, and 3 are 31, and 5 are 36.

5 and 7 are 12, and 5 are 17, and 6 are 23, and 4 are 27, and 5 are 32, and 7 are 39, and 5 are 44, and 4 are 48, and 5 are 53, and 5 are 58, and 3 are 61, and 7 are 68, and 2 are 70, and 5 are 75, and 8 are 83.

6 and 9 are 15, and 7 are 22, and 5 are 27, and 4 are 31, and 6 are 37, and 5 are 42, and 7 are 49, and 3 are 52, and 6 are 58, and 7 are 65, and 4 are 69, and 5 are 74, and 3 are 77, and 2 are 79, and 5 are 84.

7 and 6 are 13, and 4 are 17, and 3 are 20, and 3 are 23, and 7 are 30, and 8 are 38, and 7 are 45, and 4 are 49, and 5 are 54, and 8 are 62, and 5 are 67, and 4 are 71, and 8 are 79, and 7 are 86, and 5 are 91, and 7 are 98.

4 and 7 are 11, and 5 are 16, and 7 are 23, and 5 are 28, and 8 are 36.

When boys become acquainted with the combination of numbers so that they can add easily, compel them to perform their operations without naming all the figures. For example, begin with lesson first; 3, 5, 8, 9, 13, 15; 5, and carry 1 to 2, [see lesson first in addition] 3, 4, 7, 9, 12, 14; set down 14 on the left side of 5.

*Again in lesson second say,*

4, 8, 13, 15, 16, 20; 0 and carry 2 to 3;—5, 7, 10, 15, 19, 22; set down 22 on the left side of 0.

Let a number of expert boys or girls practice by this mode of reckoning, and give preference to whom due, as in spelling classes.

† ADDITION TABLE No. 1

1	2	3	4	5	6	7	8	9	9	8	7	6	5	4	3	2	1	9
2	3	4	5	6	7	8	9	9	8	7	6	5	4	3	2	1	9	1
3	4	5	6	7	8	9	9	8	7	6	5	4	3	2	1	9	1	2
4	5	6	7	8	9	9	8	7	6	5	4	3	2	1	9	1	2	3
5	6	7	8	9	9	8	7	6	5	4	3	2	1	9	1	2	3	4
6	7	8	9	9	8	7	6	5	4	3	2	1	9	1	2	3	4	5
7	8	9	9	8	7	6	5	4	3	2	1	9	1	2	3	4	5	6
8	9	9	8	7	6	5	4	3	2	1	9	1	2	3	4	5	6	7
9	9	8	7	6	5	4	3	2	1	9	1	2	3	4	5	6	7	8
9	8	7	6	5	4	3	2	1	9	1	2	3	4	5	6	7	8	9
8	7	6	5	4	3	2	1	9	1	2	3	4	5	6	7	8	9	9
7	6	5	4	3	2	1	9	1	2	3	4	5	6	7	8	9	9	8
6	5	4	3	2	1	9	1	2	3	4	5	6	7	8	9	9	8	7
5	4	3	2	1	9	1	2	3	4	5	6	7	8	9	9	8	7	6
4	3	2	1	9	1	2	3	4	5	6	7	8	9	9	8	7	6	5
3	2	1	9	1	2	3	4	5	6	7	8	9	9	8	7	6	5	4
2	1	9	1	2	3	4	5	6	7	8	9	9	8	7	6	5	4	3
1	9	1	2	3	4	5	6	7	8	9	9	8	7	6	5	4	3	2
9	1	2	3	4	5	6	7	8	9	9	8	7	6	5	4	3	2	1

This table must be reckoned to the right and left and perpendicularly, forward and backward, thus, 1, 3, 6, 10, 15, 21, 28, 36, 45, 54, 62, 69, 75, 80, 84, 87, 89, 90, 99. That is to say, 1 and 2 are 3, and 3 are 6, and 4 are 10, and 5 are 15, and 6 are 21, and 7 are 28, and 8 are 36, and 9 are 45, and 9 are 54, and 8 are 62, and 7 are 69, and 6 are 75 and 5 are 80, and 4 are 84, and 3 are 87, and 2 are 89, and one will make 90, and 9 will make 99.

Let classes exercise by this table as in spelling, giving preference to the most expert; but enjoin upon all to omit the words *is* and *are*, and the names of the figures, in order to reckon expeditiously, as 1, 3, 6, 10, 15, 21, &c. It is not, however, intended for those little gentlemen who first begin in calculation, unless they choose this mode of reckoning, by having previously familiarized their minds with the table. This mode of reckoning is intended for exercising the minds of scholars after they have made some small progress in addition—when they have learned to repeat this table readily, no class can vie with them, in even combat, without the same practical knowledge. This, as well as the other tables, ought always to hang in plain view.



## THE PESTALLOZZIAN PLAN.

### MODE OF OPERATION.

First. Instead of figures, let boys make use of peas, beans, kernels of Indian corn, short pieces of sticks, leaves of grass, of weeds, or any other convenient materials. To a certain number of these objects, add another number, then count how many there are in the whole: call this the sum total. From another number of these objects, take away a certain

number, and ascertain how many are left : call this number which is left a remainder. Thus we can perform *Addition* and *Subtraction* with real objects, instead of those which are imaginary.

This exercise will afford children pastime when they are out of school ; it will keep their minds intent on the business they are sent to perform, and will not disappoint their guardians, nor grieve their hard-labouring and frequently indigent parents.

But these two rules are not all that can be performed by moveable objects without figures. Multiplication and Division, may be wrought with the same materials on a checker-board about two feet square ; and this may be done to a considerable greater degree of profit, than is commonly received from the operations played on that fascinating time-waster.

2 By this board we can solve the following problems, and perhaps thousands more.

How many times one will two times two make ? Two times two are four, and four times one are four. Answer, four times.

3. How many times one can we make of three times two ? Three times two make six, and there are six times one in six. Answer, six times.



5. Let us make a new lesson. How many times one are three times three? Look at the three parcels of three: one, two, three, four, five, six, seven, eight, nine. Answer, nine.

6. How many times one will four times three make? Three, and three are six, and three are nine, and three are twelve. Answer, twelve.

7. How many times one are there in four times four? Look at the parcels of four, place your finger down at the end of the fourth parcel; now count how many there are till coming to your finger. Sixteen. Right. Then four times four make sixteen, or sixteen times one.

8. How many times one are two times eight: Look at two parcels of eight: count them: how many do they make? Sixteen. Right. Then two times eight are equal to four times four. Can you tell me how many eight times two will make? Count off eight parcels of two: how many do they make? Sixteen, the same as two times eight. That is right; figures will prove one and the other when reckoned right. Four times four are sixteen, two times eight are sixteen, and eight times two are sixteen.

9. I wish to know how many times one three times five will make? Count off the first, second, and third parcels of five: how many? Fifteen. Well, how many times one will five threes make? Count off five parcels of three. Five threes make fifteen also, the same as three fives. All right.

## 10. DIVISION.

Now we will try to perform Division with our checker-board.

How many times two are contained in eighteen? Place your finger at the end of eighteen on the range

of twos; how many times two are there in that space or range till coming to your finger? Ans., nine.

11. Count off thirty on the parcels of five: How many times five in thirty? Answer, six.

12. How many times eight in forty? Count off forty on the parcels of eight: how many times eight? Five.

Count off forty-eight on the same range. How many times eight? Six times.

13. In forty-nine, how many times seven? Count off forty-nine on the range of sevens; how many times seven are there? Seven times. Then seven times seven are forty-nine: all right.

14. I have sixty-four chesnuts, and wish to divide them among eight boys; how many times eight are there in sixty-four, and how many will each boy have? Count off sixty-four on the range of eights: how many times eight are there? Eight times. Then each boy must have eight. Give eight to each one and see if the operation will prove in the result.\*

15. Suppose I have forty-two walnuts, and wish to divide them equally among six boys; how many can each one have? Count off forty-two on the range of sixes: how many times six are there? Seven.

16. Nine cakes cost forty-five cents: how much was that apiece? Count off forty-five on the range of nines; how many times nine are there? Five times. Right, the cakes cost five cents each.

17. I have fifty-six pencils; how shall I divide them that seven boys may have an equal number each? Count off fifty-six on the range of sevens: how many times seven are there? Eight times. Very well, each boy must have eight pencils. But, here comes little George Sprightly; will you all consent that I divide them again and give him an equal share? Agreed.

\* Here explain *result*, and use no technique terms without explanation.

Now there are eight of you : how many must each one have ? Count off fifty-six on the range of eights : how many times eight are there ? Seven. Right, each one must have seven pencils, because seven times eight are fifty-six.

18. These questions are only a small number of specimens for the Teacher ; he may exercise his ingenuity in forming different lessons, and of such variety, as his judgment will direct from time to time for the benefit of pupils. Exercising questions similar to the following, may be given out occasionally to advantage. As, four more three, that is, four added to three, equal how many ?

19. Four, more three, more two, equal how many ?

20. Four, more three, more two, less one ; that is, one subtracted, equal how many ?

Six, more three, more two, less one, equal how many times five ?

21. Eight, multiplied by two, equals how many ?

Eight, multiplied by three, less four, equals how many times ten ?

22. Four, more the half part of two, equal how many ?

23. Fifteen, less five, gives a certain sum for a remainder : how many times five equal that remainder ?

24. The third of twelve, more the one half the third of twelve, equal how many ?

25. The third of forty-eight, and half the third of forty-eight, are equal to how many times six ? The fourth part of eight, more the third of fifteen, more the half of eighteen, equal how many times the half part of eight ? 4.

26. The younger classes, under the inspection of some one from a senior class, may be exercised with such simple, easy, and diverting questions, and save



much time, which otherwise would be worse than lost ; for this employment at home and at school, will often keep them out of mischief ; it will exercise their mental faculties, and teach them how to distinguish truth from error ; it will facilitate an attainment of the knowledge of the multiplication table suspended by the wall, and it will aid in expediting, that which is already an expeditious mode of teaching and learning arithmetic.



## KEY TO CARD NO. 6.

### SIMPLE ADDITION.

#### LESSON 1.

22 Apples.	}	I begin first by writing down in figures, twenty-two, thirty-four, twenty-one, thirty-three, twelve, twenty-three : I place them exactly one number under another as on the card.
34		
21		
33		
12		
23		Now I begin at the first right hand 3,
—		and say, 3 and 2 are 5, and 3 are 8, and
145 Ap. }	}	1 are 9, and 4 are 13, and 2 are 15 ; I set down 5 and carry one ; because there is once 10 in 15, and 5 over.
in all.		

Then I begin at the lower left hand 2, and say, 1 that I carry and 2 are 3, and 1 are 4, and 3 are 7, and 2 are 9, and 3 are twelve, and 2 are 14 ; I set down 14 on the left side of the 5, Total in figures 145 apples—In words—One hundred and forty-five.

Let each scholar write the sum total or answer in words as well as in figures.

**NOTE.**—To prove Addition, begin at top and reckon downward. See Simple Addition, Lesson 10.

## LESSON 2.

34 Peaches. 41 52 35 24 34 <hr style="width: 50px; margin-left: 0;"/> 220 Peaches.	Write down on your slate 34, under that 41, then 52, 35, 24, 34 : Begin at the lowermost right hand 4, and say, 4 and 4 are 8, and 5 are 13, and 2 are 15, and 1 are 16, and 4 are 20 : set down 0 under the 4, and carry 2 ; because there are twice 10 in 20.
--	---

Now begin at the lowermost 3, and say, 2 that I carry and 3 are 5, and 2 are 7, and 3 are 10, and 5 are 15, and 4 are 19, and 3 are 22. Set down 22 on the left side of the cipher.

Total in figures, 220 peaches. Write down in words Two hundred and twenty.

## LESSON 3.

152 Pears. 343 444 561 324 444 <hr style="width: 50px; margin-left: 0;"/> 2268 Prs. } in all.     }	Place the figures on your slate as they are on the card. Then say 4 and 4 are 8, and 1 are 9, and 4 are 13, and 3 are 16, and 2 are 18 : set down 8 and carry 1. One that I carry to 4 makes 5, and 2 are 7, and 6 are 13, and 4 are 17, and 4 are 21, and 5 are 26 : set down 6 and carry 2.
--	--

Two that I carry to 4 are 6, and 3 are 9, and 5 are 14, and 4 are 18, and 3 are 21, and 1 are 22 : set down 22 on the left side of 68. Total in figures, 2268. In words, Two thousand two hundred and sixty-eight.

## LESSON 4.

461 Apples.			Begin at 6 and say, 6 and 4 are 10,
352			and 2 are 12, and 3 are 15, and 2 are
433			17, and 1 are 18 : set down 8 and carry 1.
502			
434			One that I carry to 4 makes 5, and
346			3 are 8, and 3 are 11, and 5 are 16,
—			and 6 are 22 : set down 2 and carry 2.
2528			Two that I carry to 3 are 5, and 4
			are 9, and 5 are 14, and 4 are 18, and 3 are 21, and 4
			are 25 : set down 25 on the left side of 28. Total in
			figures 2528. In words, Two thousand five hundred
			and twenty-eight Apples.

## LESSON 5.

564 Peaches			Begin at the 2 and say, 2 and 4 are
456			6, and 3 are 9, and 2 are 11, and 6
352			are 17, and 4 are 21 : set down 1 and
463			carry 2.
624			
102			<i>Second Column.</i>
—			Two that I carry to 2 are 4, and 6
			are 10, and 5 are 15, and 5 are 20,
2561 Pea- }			and 6 are 26 : set down 6 and carry 2.
ches in all. }			<i>Third Column.</i>

Two that I carry and 1 are 3, and 6 are 9, and 4 are 13, and 3 are 16, and 4 are 20, and 5 are 25 : set down 25 on the left side of 61. Total in figures, 2561. In words, Two thousand five hundred and sixty one peaches.

N. B. The Numeration Table must be suspended in plain view, and copied on the slates occasionally. See Card No. 10.

## LESSON 6.

1562 Pears.

*First Column.*

2446

3125

4563

2344

4653

Begin at the lowermost 3 on the right hand and say, 3 and 4 are 7, and 3 are 10, and 5 are 15, and 6 are 21, and 2 are 23: set down 3 and carry 2.

*Second Column.*

Two that I carry to 5 are 7, and 4 are 11, and 6 are 17, and 2 are 19, and 4 are 23, and 6 are 29: set down 9 and carry 2.

*Third Column.*

Two that I carry to 6 make 8, and 3 are 11, and 5 are 16, and 1 makes 17, and 4 are 21, and 5 are 26: set down 6 and carry 2.

*Fourth Column.*

Two that I carry to 4 make 6, and 2 are 8, and 4 are 12, and three are 15, and 2 are 17, and 1 are 18: set down 18 on the left side of 693. Total in figures 18693. I words, Eighteen thousand six hundred and ninety-three.

## LESSON 7.

3470 Apples.

2665

4670

3760

0040

4000

As the figures are all ciphers in the first column except a 5, set down 5 and begin with the second column, thus, 4 and 6 are 10 and 7 are 17 and 6 are 23, and 7 are 30: set down 0 and carry 3, because there are three tens in 30.

18605

*Third Column.*

Three that I carry and 7 are 10, and 6 are 16, and 6 are 22, and 4 are 26: set down 6 and carry 2.

*Fourth Column.*

Two that I carry to 4 are 6, and 3 are 9, and 4 are 13, and 2 are 15, and 3 are 18: set down 18 on the left side of 605. Total in figures, 18605. In words, Eighteen thousand six hundred and five.

## LESSON 8.

6410 Peaches.

*First Column.*

7520

Set down 7, because there is no other figure except ciphers.

4060

*Second Column.*

5007

One and 6 make 7, and 2 are 9, and one are 10: set down 0 and carry 1.

7010

2200

---

32207*Third Column.*

One that I carry to 2 makes 3, and 5 are 8, and 4 are 12: set down 2 and carry 1.

*Fourth Column.*

One that I carry to 2 makes 3, and 7 are 10, and 5 are 15, and 4 are 19, and 7 are 26, and 6 are 32: set down 32. Total in figures 32207. In words, Thirty-two thousand two hundred and seven.

## LESSON 9.

7420 Pears.

*First Column.*

302

Look up along the ciphers in the right hand column till coming to 8, then say, 8 and 2 are 10: set down 0 and carry 1.

5008

710

4500

3300

*Second Column.*

One that I carry and 1 make 2, and 2 are 4; set down 4 and carry nothing, because there are not ten in four.

---

21240*Third Column.*

Three and 5 are 8, and 7 are 15, and 3 are 18, and 4 are 22: set down 2 and carry 2.

*Fourth Column.*

Two that I carry to 3 are 5, and 4 are 9, and 5 are 14, and 7 are 21: set down 21. Total in figures 21240. In words, Twenty-one thousand two hundred and forty.

## LESSON 10.

*To prove and elucidate Addition,*We will add all the *units* by themselves, the *tens* by themselves, the *hundreds* by themselves, the *thousands*

by themselves, &c. and find the amount of each severally and collectively.

*Columns.*

4th.	3rd.	2nd.	1st.	1st. Units.	2nd. Tens.	3rd. Hundreds.	4th. Thousands.
1	4	5	6	6	50	400	1000
3	2	6	4	4	60	200	3000
4	1	3	7	7	30	100	4000
<hr/>				<hr/>	<hr/>	<hr/>	<hr/>
8	8	5	7	17	140	700	8000

Here the column of units makes 17, the column of tens 140, the column of hundreds 700, and the column of thousands 8000.

*Recapitulation.*

Amount of the first column,	17
Amount of the second column,	140
Amount of the third column,	700
Amount of the fourth column,	8000

Amount ascertained collectively, 8857

Thus we see, whatever be carried from the place of units, must be considered as the same number of tens; whatever number we carry from the place of tens, must be considered as the same number of hundreds; and whatever we carry from hundreds, must be considered as the same number of thousands, &c. That is—2 carried from units will be 2 tens or 20; 2 carried from tens will be twice ten tens or 200; and 2 carried from hundreds, will make twice one hundred times ten or 2000.

The teacher will please to observe, that lesson No. 10 is intended as an assistant to refresh his memory in lecturing pupils, when showing them the propriety of carrying at every ten. The reason why this explanation was not inserted at the beginning of the rule, is as follows:—Learners cannot understand lecturing on any subject whatever, till they have been instructed in some of the principles or component parts of the same.

By this specimen teachers can form as many lectures as the age and capacity of the pupils may require.

## LESSON 11.

432	832	634	235	133
528	125	328	733	832
633	424	325	526	724
317	520	622	421	217
514	415	316	217	615
49	511	613	715	39
25	36	47	58	6
3	3	3	3	

## LESSON 12.

631	432	333	134	0
325	528	630	833	932
122	233	324	425	523
821	721	621	521	418
113	614	415	216	514
812	38	511	714	49
14	25	36	47	5
3	3	2	3	

32 3 4 5 3

## LESSON 13.

844	743	642	541	441
136	236	336	436	537
435	534	633	732	832
531	429	327	235	124
626	425	224	0	723
320	521	722	923	216
917	816	715	614	514
0	18	28	38	49
4	37	26	15	5
4	4	4	4	

31 2 3 4 2

## LESSON 14.

148	247	346	445	540
847	745	643	541	435
0	338	637	936	131
939	636	331	0	830
430	429	628	827	222
526	525	322	119	720
121	220	319	418	512
820	718	616	514	48
812	711	610	59	4
4	4	4	4	

44 3 2 1 1

## LESSON 15.

348	848	748	548	644
645	140	241	443	338
739	839	239	339	435
232	131	737	636	531
130	830	730	630	226
829	122	223	324	724
121	121	121	421	417
820	820	820	517	513
812	812	812	812	8
4	4	4	4	

48 7 6 5 0

## LESSON 16.

647	247	447	547	343
341	745	543	442	640
438	538	138	238	334
534	433	837	736	631
129	129	129	129	125
828	828	828	828	824
420	320	220	720	616
516	617	718	213	310
711	711	711	711	7
4	4	4	4	

48 8 8 8 4

47 7 7 7 3

These lessons of mixed figures may be copied on the slate, omitting the sums total, and after the learner has computed them once or twice, he may copy them again, omitting the small figures also.

When a teacher or monitor is examining the sums total of Addition, let him observe first, how many horizontal lines there are in the lesson; if seven, then there are three pairs or couplets and an odd line at the bottom. If the lesson consists of nine lines, there will be four couplets and an odd line. When a sum or lesson consists of three couplets, subtract 3 from the right hand bottom figure, and at the same instant set 3 on the left of the total line and bring down the remaining part of the odd line; as for example:—In lesson 11th, 2, 3, 4, 5, 6, make the odd line, and there are six lines above, which include three couplets; take 3 from 6 and 3 remain; set 3 in the sum total under 6, and set 3 on the left of the whole; then bring down the residue of the odd line, 2, 3, 4, 5, and the work will be done.

In forming new lessons, observe, any two lines which make a couplet, being added together, their sums must be 9, 9, 9, 9. For instance—take the two upper lines of lesson 11th, begin at the left hand, there you will see that 5 and 4 make 9; 1 and 8 make 9; 3 and 6 make 9; 7 and 2 make 9; and 8 added to 1 will make 9.

*Questions applied in Simple Addition.*

17. If a person have on hand \$455 in cash; if there be owing to him in book accounts \$1059; in notes \$109, and in bond \$560; how much is the amount?

Answer, \$2,183.

18. If a man was born in the year 1755, when will he be 63 years of age? Answer, in the year 1818.

19. Suppose one bond be \$3042, the principal of another \$560, with \$73 interest; how much will the two obligations amount to, principal and interest?

Answer, \$3,675.

N. B. Dollar characters are made thus, \$.



20. Add 4,672, 6,921, 2,864, 250, 28, and five hundred and ninety together, make the amount 15325.

21. How many strokes does a clock strike in four days?  
Answer, 624.

22. One cask of nails contains 348 pounds, a second cask 582, a third 944, a fourth 1421, and a fifth 1319; how many pounds are in the whole?

Answer, 4614.

23. If 4 bales of cloth contain 40 pieces, and those pieces contain 1120 yards, and two other bales contain 24 pieces, in which are 720 yards; how many pieces and yards are there in the whole?

Answer, 64 pieces and 1840 yards.

24. I pay 22 cents for butter, 34 for beef, 19 for mutton, 12 for vegetables, 18 for fish, 37 for cheese, add 75 for a bushel of salt; to how many cents do they all amount?

Answer, 217.

25. A man hired a farm for which he paid \$102 at the time of taking possession, \$306 at the end of four years, \$408 at the end of eight years, and \$224 at the end of the term of ten years; how much was the amount of the rent?

Answer, \$1040.

26. I borrowed a sum of money, and paid in part \$125; on examining my books, found \$115 due to the lender; how much was the sum borrowed?

Answer, \$240.

27. There are two numbers, their difference is 155, and the lesser number is 172; what is the greater number?

Answer, 327.

28. In travelling one week I expended 155 cents the first day, 162 the second day, on the third I paid for mending my waggon a sum equal to the whole I had paid out on the two previous days, and 175 cents over; at the end of the week, found by memo-

randums that I had paid out 337 cents more; how many cents were paid out in the whole?

Answer, 1146.

29. John, James, and Harry, purchased a cargo of salt. John paid \$105, James paid \$1,327, and Harry paid a sum equal to three times that of John, and twice the sum of James; what did the salt cost?

Answer, \$4,401.



SIMPLE SUBTRACTION, shows how to take a small sum from a larger: as, 4 from 7, there remain 3; from 11 take 6, and 5 remain; 12 from 20, 8 remain.

COMPOUND SUBTRACTION, teaches how to take sums of different denominations from larger sums of the same kind: as, pounds, shillings and pence, from pounds, shillings and pence; bushels, pecks and quarts, from numbers of the same kind; gallons, quarts and jills, from quantities of the same denominations; \*hundreds, quarters and pounds, from the same denominations, &c. &c. See Card 26.

## KEY TO CARD No. 6.

### LESSON 1.

I borrowed 2,468 dollars, and paid 1345; how much remains due? Answer, 1,123 dollars.

#### *Directions how to work.*

Write down in figures 2468, and exactly under those figures write 1345 as you see them on the card.

2468	Bor.		Begin with the 5 and say, 5 from 8
1345	Paid.		there remain 3: set down 3. Then 4
—			from 6 there remain 2: set down 2.
1123	Due.		Then 3 from 4 and 1 remains: set down
1.			1. Then 1 from 2 and 1 remains: set down 1.

\*In the state of New-York, 100 pounds are allowed to be one hundred weight avoirdupois.

## LESSON 2.

I wish to know the difference between 45621 and 35242.      Answer, 10379.

**DIRECTIONS.** *Look at the Card, Lesson 2.*

Set down 45621, and under that 35242.

45621		Begin with the 2 on the right and say,
35242		2 from 1, I cannot; borrow 10 from the
-----		place of tens and say, 2 from 11 and 9
10379 dif.		remain—carry the 10 that I borrowed
		but call it one; 1 to 4 makes 5—5 from 2, I cannot;
		borrow 10 from the place of hundreds, and say, 5
		from 12 and 7 remain—carry 1 to 2 makes 3—3 from
		6 and 3 remain; 5 from 5 and 0 remains—3 from 4
		and 1 remains.

## LESSON 3.

582137 Dollars lent to the United States.

216232 Received back.

-----  
365905 Yet due.

*Operate thus.*

Two from 7, 5 remain—3 from 3, 0 remains—2 from 1, I cannot take; borrow 10 and say, 2 from 11 and 9 remain—carry 1 to 6 makes 7—7 from 2, I cannot; borrow 10 and say, 7 from 12 and 5 remain—carry 1 to 1 makes 2—2 from 8 and 6 remain—2 from 5 and 3 remain.

The sum due is 365905. In words, Three hundred sixty-five thousand nine hundred and five.

## LESSON 4.

456821 Dollars in the Bank.

324912 Received out.

-----  
131909 Dollars remain in the Bank.

Prepare your work on the slate like lesson 4, on the card. Now say, 2 from 1, I cannot; borrow 10 and say, 2 from 11—9 remain—carry 1 to 1 makes 2.

—2 from 2 and 0 remains—9 from 8, I cannot; borrow 10 and say, 9 from 18 and 9 remain—carry 1 to 4 makes 5—5 from 6 and 1 remains—2 from 5 and 3 remain—3 from 4 and 1 remains. Answer in figures, 131909. In words, One hundred and thirty-one thousand nine hundred and nine.

## LESSON 5.

601021 Dollars sent to sea.

8970 Lost.

592051 On hand. { *Prepare your work on the  
slate from card 6, lesson 5.*

Nothing from 1 and 1 remains—7 from 2, I cannot; borrow 10 and say, 7 from 12 and 5 remain—carry 1 to 9 makes 10—10 from 0, I cannot; borrow 10 and say, 10 from 10 and 0 remains—carry 1 to 8 makes 9—9 from 1, I cannot; borrow 10 and say, 9 from 11 and 2 remain—carry 1—1 from 0, I cannot; borrow 10 and say, 1 from 10 and 9 remain—carry 1—1 from 6 and 5 remain.

The sum remaining on hand is in figures 592051. In words, Five hundred and ninety-two thousand and fifty-one.

## LESSON 6.

Received in, 821903 Dollars.

Paid out, 266232

On hand, 555671

*Prepare the work as  
on card No. 6.*

Begin at the right hand 2 and say, 2 from 3 and 1 remains—3 from 10 and 7 remain—carry 1—1 to 2 makes 3—3 from 9—6 remain—6 from 11 and 5 remain—carry 1 to 6 makes 7—7 from 12 and 5 remain—carry 1 to 2 makes 3—3 from 8 and 5 remain. Answer in figures 555671.

## LESSON 7.

Received from Government, \$781210

Expended in purchases, 521621

Remains on hand, 259589

One from 0, I cannot; but 1 from 10 and 9 remain; carry 1 to 2 makes 3—3 from 11 and 8 remain—carry 1 to 6 makes 7—7 from 12 and 5 remain—carry 1 to 1 makes 2—2 from 11 and 9 remain—carry 1 to 2 makes 3—3 from 8 and 5 remain—5 from 7 and 2 remain.

Answer in figures, 259589. In words, Two hundred and fifty-nine thousand five hundred and eighty-nine.

### PROOF BY ADDITION.

Add the two lower lines to make a total equal to the upper line; thus,

Second line, 521621

Third line, 259589

Like the first line, 781210 Proof.

### LESSON 8.

If 641315 Soldiers enter Russia,  
and 426436 are lost, how many return?

Ans. 214879 return.

Six from 5, I cannot; borrow 10, and say, 6 from 15, and 9 remain—carry 1 to 3 makes 4—4 from 11 and 7 remain—carry 1 to 4 makes 5—5 from 13 and 8 remain—carry 1 to 6 makes 7—7 from 11 and 4 remain—carry 1 to 2 makes 3—3 from 4 and 1 remains—4 from 6 and 2 remain.

Answer in figures, 214879. In words, Two hundred and fourteen thousand eight hundred and seventy-nine.

### LESSON 9.

What is the difference between 456781, and 326879?  
Place the figures as on the card.

456781		Nine from 1, I cannot; borrow 10 and
326879		say, 9 from 11 and 2 remain—carry 1 to 7
————		makes 8—8 from 8, 0 remains—8 from 7
129902		I cannot; borrow 10 and say, 8 from 17

and 9 remain—carry 1 to 6 makes 7—7 from 6, I cannot; borrow 10 and say 7 from 16 and 9 remain—carry 1 to 2 makes 3—3 from 5 and 2 remain—3 from 4 and 1 remains.

Difference in figures 129902. In words, One hundred and twenty-nine thousand nine hundred and two.

### PROOF BY ADDITION.

Place the second line on your slate—Under that place the third line, then add,

Second line, 326879

Third line, 129902

---

Like unto the first line 456781 Proof.

### LESSON 10.

If I have on hand 642137 Shingle nails, and use 472318, how many remain on hand?

Place your figures as in Lesson 10, on the card.

642137 Nails on hand,

472318 Made use of,

---

169819 Remain on hand.

Eight from 7, I cannot; borrow 10 and say, 8 from 17 and 9 remain—carry 1 to 1 makes 2—2 from 3 and 1 remains—3 from 1, I cannot; borrow 10 and say, 3 from 11 and 8 remain—carry 1 to 2 makes 3—3 from 2, I cannot; borrow 10 and say, 3 from 12 and 9 remain—carry 1 to 7 makes 8—8 from 4 I cannot; borrow 10 and say, 8 from 14 and 6 remain—carry 1 to 4 is 5—5 from 6 and 1 remains. Answer in figures, 169819. In words, One hundred and sixty-nine thousand eight hundred and nineteen.

### PROOF BY ADDITION.

I made use of 472318 Nails,

Remain on hand 169819

---

Like the first line 642137 on hand before they were used.

## LESSON 11.

Bought 460210 Awl blades,  
 Sold 340012 how many remain?

Answer, 120198

Two from 0, I cannot; borrow 10 and say, 2 from 10 and 8 remain—carry 1 to 1 makes 2—2 from 11 and 9 remain—carry 1 to 0 makes 1—1 from 2 and 1 remains—0 from 0 and 0 remains—4 from 6 and 2 remain—3 from 4 and 1 remains. Answer in figures, 120198. In words, One hundred and twenty thousand one hundred and ninety-eight.

## PROOF BY ADDITION.

Sold	340012
Remain unsold	120198

The number bought 460210 Proof.

Now let the learners omit their *phrases* in saying, "borrow 10." They may mentally consider it without speaking aloud. See Lesson 12.

## LESSON 12.

From 900000  
 Take 426436 how many remain?

Answer, 473564

Six from 10 and 4 remain—carry 1 to 3 is 4—4 from 10 and 6 remain—carry 1 to 4 is 5—5 from 10 and 5 remain—carry 1 to 6 is 7—7 from 10 and 3 remain—carry 1 to 2 is 3—3 from 10 and 7 remain—carry 1 to 4 is 5—5 from 9 and 4 remain.

Answer in figures, 473564. In words, Four hundred and seventy-three thousand five hundred and sixty-four.

## LESSON 13.

\$ 54321 Borrowed, April 17th, 1834.

18765 Paid, May 1st, 1834, how many dollars  
remain due?

Ans. 35556 Remain due.

Five from 11 and 6 remain—carry 1 to 6 makes 7—7 from 12 and 5 remain—carry 1 to 7 is 8—8 from 13 and 5 remain—carry 1 to 8 is 9—9 from 14 and 5 remain—carry 1 to 1 is 2—2 from 5 and 3 remain.

Answer in figures, 35556. In words, Thirty-five thousand five hundred and fifty-six.

## LESSON 14.

Borrowed 628134 Dollars.

Paid 419243 What remains due?

Answer, 208891 Dollars remain due.

Three from 4 and 1 remains—4 from 13 and 9 remain—carry 1 to 2 is 3—3 from 11 and 8 remain—carry 1 to 9 makes 10—10 from 18 and 8 remain—carry 1 to 1 makes 2—2 from 2—0 remains—4 from 6—2 remain.

Answer in figures, 208891. In words, Two hundred and eight thousand eight hundred and ninety-one.

## LESSON 15.

Lent 644310 dollars. Received back 421536 dollars. I wish to know how many dollars are yet due?

The sum lent, 644310 dollars.

Received, 421536

222774 due.

Six from 10 and 4 remain—carry 1 to 3 is 4—4 from 11 and 7 remain—carry 1 to 5 is 6—6 from 13 and 7 remain—carry 1 to 1 is 2—2 from 4 and 2 remain—2 from 4 and 2 remain—4 from 6 and 2 remain.

Answer, 222774.

NOTE.—It is necessary to show the learners the analogy between Multiplication and Addition, as 2 and 2 are 4, and 2 are 6, and 2 are 8, or 4 times 2 are 8 &c. And in Division, teach them that Subtraction will answer problems in that Rule. See Lecturing, by Index.



## + QUESTIONS.

What is *Subtraction*?

What is the sign of Subtraction?

What are the three terms or numbers called?

## LESSON 16.

Received 4 6 4<sub>14</sub> 2<sub>12</sub> 1  
 Paid out 3 5 6 3 0  
           1 1

---

1 0 7 9 1

## LESSON 18.

Received 3 4 5 6<sub>16</sub> 7<sub>17</sub>  
 Paid back 1 4 4 8 9  
           1 1

---

2 0 0 7 8

## LESSON 20.

From 7 6 2<sub>12</sub> 7 1<sub>11</sub>  
 Take 3 5 8 6 2  
           1 1

---

Remaining 4 0 4 0 9

## LESSON 22.

From 4 8 2<sub>12</sub> 3<sub>13</sub> 2  
 Take 2 7 9 8 1  
           1 1

---

Remaining 2 0 2 5 1

## LESSON 24.

Received 5 6 7 8<sub>18</sub> 1<sub>11</sub>  
 Paid out 4 6 3 9 2  
           1 1

---

On hand 1 0 3 8 9

## LESSON 26.

Received 4 6 8 0<sub>10</sub> 1  
 Paid out 3 5 7 9 0  
           1

---

On hand 1 1 0 1 1

## LESSON 17.

7 6 4<sub>14</sub> 5<sub>15</sub> 2<sub>12</sub> 2  
 3 4 6 5 4 2  
           1 1 1

---

4 1 7 9 8 0

## LESSON 19.

7 6 4<sub>14</sub> 2<sub>12</sub> 1<sub>11</sub>  
 4 4 8 2 3  
           1 1 1

---

3 1 5 9 8

## LESSON 21.

4 8<sub>18</sub> 2<sub>12</sub> 1<sub>11</sub> 3 9  
 3 9 6 5 1 5  
           1 1 1

---

0 8 5 6 2 4

## LESSON 23.

7 1<sub>11</sub> 2<sub>12</sub> 9 3  
 6 7 8 9 0  
           1 1

---

0 3 4 0 3

## LESSON 25.

7 6<sub>16</sub> 5<sub>15</sub> 4<sub>14</sub> 3 2  
 6 7 8 9 0 1  
           1 1 1

---

0 8 6 5 3 1

## LESSON 27.

1 0<sub>10</sub> 0<sub>10</sub> 0<sub>10</sub> 0<sub>10</sub>  
 0 9 9 9 9  
           1 1 1 1

---

0 0 0 0 1

## LESSON 28.

Borrowed	1	0 <sub>10</sub>	0 <sub>10</sub>	4 <sub>14</sub>	5 <sub>15</sub>
Paid	0	3	4	5	6
	1	1	1	1	

Owing 0 6 5 8 9

## LESSON 29.

8	0 <sub>10</sub>	0 <sub>10</sub>	9	4 <sub>14</sub>	0 <sub>10</sub>
0	7	3	8	5	1
1	1		1	1	

7 2 7 0 8 9

## LESSON 30.

Borrowed	1	3 <sub>13</sub>	5 <sub>15</sub>	7 <sub>17</sub>	9
Paid	0	4	5	8	5
	1	1	1		

Owing 0 8 9 9 4

## LESSON 31.

6	0 <sub>10</sub>	4	0 <sub>10</sub>	5
5	4	2	1	3
5		1		

0 6 1 9 2

To prove Subtraction, as mentioned under lesson 7, add the two lower lines together; their sum will be equal to the upper line when the work is correct. Take lesson 28, 29, 30, 31: add the second line, called *minor*, to the third line, called *remainder*; their sums will be 10045; 800940 13579; 60405.

## EXAMPLES.

## LESSON 28.

Minor	0	3	4	5	6
Remainder	0	6	5	8	9

Proof 1 0 0 4 5

## LESSON 29.

0	7	3	8	5	1
7	2	7	0	8	9

8 0 0 9 4 0

## LESSON 30.

Minor	0	4	5	8	5
Remainder	0	8	9	9	4

Proof 1 3 5 7 9

## LESSON 31.

5	4	2	1	3
0	6	1	9	2

6 0 4 0 5

*Questions applied in Simple Subtraction.*

32. A man was born in the year 1755; I demand his age in the year 1834? Answer 79.

33. I borrowed \$3090, and paid \$1979; how much remained due to the lender? Answer \$1111.

34. There are two numbers, the greater is 104, and the lesser 69; what is their difference? Ans. 35.

35. From 1072 take 385, and from the remainder take 465 ; what will be the second remainder ?

Answer 222.

36. A boy going to the bank with three parcels of money, the first containing \$730, the second \$350 and the third \$1001, but accidentally lost one parcel, and paid in only \$1080 ; how much was lost ?

Answer \$1001.

37. Two farmers agreed to reckon and settle their accounts : one had charged on his book 125 cents, 340 cents, 17 cents, 19 cents, and 62 cents : the other had an account amounting to 463 cents ; what was the difference of their accounts ?

Ans. 100 cents.

38. A baker bought two barrels of flour : the first weighed 224 pounds, but the barrel, called tare, weighed 27 pounds ; the second weighed 225 pounds, with the tare, which weighed 28 pounds ; I demand how much the flour weighed after subtracting the tare ?

Answer 394 pounds.

39 There are two numbers which have a difference of 103, and the greater number is 300 ; what is the lesser number ?

Ans. 197.

40. A, has a note against B for \$505, and a book account for \$75 without interest : B paid at one time \$94, at another \$102, at a third time \$123, and at a fourth time \$128 ; how many dollars are yet due to A ?

Answer \$133.

41. A note of \$420, has \$29 interest due thereon, \$162 are paid, and a second note given for the balance due. The second note remains unpaid till the sum of \$20 interest is due, at which time a payment is made of \$150 and a new note given for the residue ; how much was the new note ?

Ans. \$157.

42. A bankrupt at the time of failing owed for sundry goods \$480, for unimproved land \$652, for a gristmill \$975, and for house-rent \$300 : at the time

of stopping payment, he had good bonds and notes to the amount of \$876, cash \$253, and his land was valued at \$450 ; what sum did his creditors lose ?

Answer \$808.

43. A merchant entering into trade, owed \$440, he had in cash and stock to the amount of \$9042 : he made \$521 clear profit the first year ; what was the value of his estate after paying the sum he owed ?

Answer \$9123.

After the learners have written the Numeration Table several times, lecture and interrogate them in the following manner, as far so may be supposed requisite.

In what place do we find *units* ? At the right hand of whole numbers.

In what place do we find *tens* ? In the second place of any number of integers towards the left, on the left side of units.

In what place do we find *hundreds* ? In the third place.

In what place do we find *thousands* ? In the fourth place.

In what place do we find *tens of thousands* ? In the fifth place.

In what place do we find *hundreds of thousands* ? In the sixth place.

What general remarks may be made respecting numbers with regard to *numeration* ?

Every third place towards the left will be hundreds : every second, fifth, eighth, eleventh, &c. will be tens ; and every seventh, thirteenth, nineteenth, and twenty-fifth, will bear a new name, as *Units*, tens, hundreds, thousands, tens of thousands, hundreds of thousands ; *Millions*, tens of millions, hundreds of millions, thousands of millions, tens of thousands of millions, hundreds of thousands of millions ; *Billions*, tens of billions, hundreds of billions, thousands of billions, tens of thousands of billions, hundreds of thousands of

billions; *Trillions*, tens of trillions, hundreds of trillions, thousands of trillions, tens of thousands of trillions, hundreds of thousands of trillions; &c. without end.

In what proportion do these numbers rise?

In a ten fold proportion; as 1; 10, ten ones; 100, one hundred ones; 1,000, one thousand ones; 10,000, ten thousand ones; 100,000, one hundred thousand ones; 1,000,000, one million of ones; 10,000,000, ten million of ones; &c. See Numeration Table No. 2, after No. 1.

A million has six ciphers on the right side of 1; as 1,000,000. A billion is equal to a million of millions, that is the product of a million when multiplied by itself; as, 1,000,000,000,000. A trillion is equal to a million multiplied by itself, and that product multiplied again by a million, containing or requiring eighteen ciphers on the right hand of 1; thus, 1,000,000,000,000,000,000,000.

A Quatrillion is a million involved four times, and requires four times the number of ciphers on the right hand side of 1, that are in a million, viz. twenty-four; thus, 1,000,000,000,000,000,000,000,000,000.

Billions signify the involution or multiplication of millions twice; Trillions three times; Quatrillions four; Quintrillions five; Sextillions six; Septillions seven; Octillions eight; Nonillions nine; Decillions ten; Undecillions eleven; Duodecillions twelve; Triodecillions thirteen; &c. without end. The whole of these sextuple numbers, or numbers by six, are formed by adding six ciphers or figures as before observed; for instance, a million contains six ciphers or places of figures; a billion twelve; a trillion eighteen; a quatrillion twenty-four; and so for the residue.

But here let it be noted, that young students must not be puzzled with all these abstruse particulars, till they have advanced in the more profitable branches of arithmetic: the teacher must be the judge and su-

perintend with discreetness in managing, and select from time to time, an appropriate part, suitable for the pupils. Nine or twelve figures at first, are abundantly sufficient.



## SIMPLE MULTIPLICATION.

*To the Teacher, but not for the learner till coming to Lesson 1st.*

Now the Multiplication Table must be copied on the slates from Cards No. 8 and 9, and detached parts of it copied on pieces of paper for each one to look at occasionally—or the whole of the Tables may be hung round the room for daily inspection. After going over the lessons in simple Addition and Subtraction, and answering a few questions in Simple Multiplication, the learner may begin with Compound Addition of money.

The denominations of Federal Money however, are needless, except Dollars and Cents: These comprise the calculations of our business in the United States—they convey all our ideas respecting purchases, sales, and amounts. When fractional parts of a cent are to be reckoned in the price of several articles, Addition or Multiplication will show the amount as in whole numbers.

### EXAMPLE 1.

Bo't 255 finished penknives, at 75.4 cents\* each;  
what is the amount?      Answer, \$192.27 cents.

\* This number 75.4 must be read thus, "Seventy-five and four-tenths of a cent."

*Operation as in whole numbers.*

255 Penknives.
75.4 Cents.
<hr/>
1020
1275
1785
<hr/>
192 27.0

By the rule of Decimals, "point off as many *fractional parts* from the product, as are contained in the *multiplicand* and *multiplier*"—the remainder on the left hand will be whole numbers. Therefore, point off the 0, on the right hand, and the numbers 19227, will be whole numbers or cents ; then cut off two figures of the residue, and those on the left will be dollars.

*Rule to bring cents into dollars.*

Cut off the two right hand figures of any number of cents, and those on the left will be dollars..

Thus, 100 cents, or 1 dollar,	1 00
120 cents, or 1 dollar and 20 cents,	1 20
150 cents, or 1 dollar and 50 cents,	1 50
550 cents, or 5 dollars and 50 cents,	5 50

See Long Division, Lesson 13.

**EXAMPLE 2.**

Bo't 250 Copy-books, at 24.75\* cents each, what did they come to?

Answer, \$61.87½

*Operation.*

24.75 Cents.
250 Copy-books.
<hr/>
12375
4950
<hr/>
61 87.50

Here I point off two figures for decimal parts, because there are two decimals in the multiplicand ; —then the figures 6187, are whole numbers or cents. Cut off the two right hand figures, 87, and those on the left are dollars. The fractional parts 50 first pointed off, may be called,  $\frac{50}{100}$ , or  $\frac{5}{10}$ , or  $\frac{1}{2}$ , and when methodically inserted, they will stand thus, .50 or .5 ; and .5, equal  $\frac{1}{2}$  of any thing.

\* This number 24.75, must be read, "Twenty-four and seventy-five hundredths."

A little lecturing will soon show the learners how to value these fractional parts, and enable them to work United States currency, before they understand Decimals.\*

.1 .2 .3 .4 .5 .6 .7 .8 .9 .25 .5 .75  
 $\frac{1}{10}$   $\frac{2}{10}$   $\frac{3}{10}$   $\frac{4}{10}$   $\frac{5}{10}$   $\frac{6}{10}$   $\frac{7}{10}$   $\frac{8}{10}$   $\frac{9}{10}$   $\frac{25}{100}$  or  $\frac{1}{4}$ ;  $\frac{1}{2}$   $\frac{75}{100}$  or  $\frac{3}{4}$

These are of as small value as business will require ; and if the parties in commerce, know what part of a cent they agree to in the price of one or more articles, they may, by the above method of Multiplication, or by Addition, calculate the amount to a degree of minuteness. Consequently it is not requisite to trouble learners with a series of hard names ; such as, "Ten mill make one cent ; ten cents one dime ; ten dimes one dollar ; ten dollars one eagle," when one simple expression will answer every purpose intended, viz :

One hundred Cents make One Dollar.

## KEY TO CARD No. 10.

### LESSON 1.

In 123456 pair of shoes, how many shoes ?  
 2 Shoes in a pair.

246912

Twice 6 are 12 ; set down 2 and carry 1—twice 5 are 10, and one 1 carried makes 11 ; set down 1 and carry 1—twice 4 are 8, and one 1 carried makes 9 ; set down 9—twice 3 are 6 ; set down 6—twice 2 are 4 ; set down 4—twice 1 is 2 ; set down 2.

Write down the answer in letters, Two hundred and forty-six thousand, nine hundred and twelve.

\* The modern mode of naming Fractions, is to call Vulgar Fractions, *fractions*, and Decimal Fractions, *decimals* ; but as books are printed differently we will not disagree about trifles : We will follow the usual method till the Teacher please to alter the phraseology.



Those who cannot read their answers in figures, may lose their place and number as in spelling.

*Proof of Lesson first by Short Division.*

$$\begin{array}{r} 2)246912 \\ 123456 \end{array}$$

NOTE.—When the divisor does not exceed 12, the work is called Short Division.

Say, 2 in 2, once; set down 1 under the 2. Two in 4, twice; set down 2 under the 4. Two in 6, three times; set down 3 under the 6. Two in 9 four times and 1 over; set down 4 under the 9—carry the 1 over, to the left side of the 1, makes 11. Two in 11 five times and one over; set down 5 under the 1, and carry the 1 over to the left side of the 2, makes 12. Two in 12, six times; set down 6 under the 2.

Write down in letters, One hundred and twenty-three thousand, four hundred and fifty-six.

## LESSON 2.

In 654321 yards of three feet each, how many feet?

Answer, 1962963.

*Operation.*

654321 Yards,  
3 Feet in a yard,

1962963 Total, or Product in feet.

Three times 1 are 3—set down 3—3 times 2 are 6—set down 6—three times 3 are 9—set down 9—three times 4 are 12—set down 2 and carry 1—three times 5 are 15, and 1 that I carried makes 16—set down 6 and carry 1—three times 6 are 18, and 1 that I carried makes 19—set down 19. Answer in words, One million, nine hundred and sixty-two thousand, nine hundred and sixty-three.

## PROOF BY DIVISION.

3)1962963 Divisor and Dividend.

654321 Quotient or proof.

Three in 19—6 times and 1 over—carry the 1 to 6 makes 16; three in 16—5 times and 1 over—carry the 1 to 2 makes 12—three in 12—4 times—three in 9—3 times—three in 6—2 times—three in 3—once; down with 1.

## LESSON 3.

Multiplicand, 789		In 789 bushels how many pecks, allowing 4 pecks to each bushel?
Multiplier, 4		
<hr/>		
Product, 3156		Pecks.

*Operation with words.*

Four times 9 are 36; set down 6 and carry 3—4 times 8 are 32, and 3 I carried are 35; set down 5 and carry 3—4 times 7 are 28, and 3 I carried are 31; set down 31.

Answer in words, Three thousand one hundred and fifty-six.

*Proof by Division.*

4)3156

789 Proof of lesson 3.

Fours in 31, 7 times and 3 over—carry 3 and prefix it to 5 makes 35—4 in 35, 8 times and 3 over—carry 3 and prefix it to 6 makes 36—4 in 36, 9 times.

## LESSON 4.

In 987 five dollar bills, how many dollars?  
5 dollars in each bill.

---

4935 Dollars—sum total, or product.

Five times 7 are 35; set down 5 and carry 3—5 times 8 are 40, and 3 that I carried are 43; 3 and carry 4—5 times 9 are 45, and 4 that I carried are 49—set down 49.

Answer in words, Four thousand nine hundred and thirty-five.

*Proof by Division of lesson 4th.*

5)4935

987 Quotient or Proof.

Five in 49—9 times and 4 over—5 in 43—8 times  
and 3 over—5 in 35—7 times.

KEY TO CARD No. 11.

### LESSON 5.

In 246 fathom of 6 feet each, how many feet?

6

*Place the figures as on the card.*

1476

Begin under the 6 and say 6 time 6 are 36—6 and  
carry 3—6 times 4 are 24 and 3 I carried are 27—  
and carry 2—6 times 2 are 12 and 2 I carried are 14.

Answer in words, One thousand four hundred and  
seventy-six.

*Proof of lesson fifth by Division.*

6)1476

246

Six in 14—twice and 2 over; set down 2 and car—  
ry the 2 over to 7—6 in 27—4 times and 3 over—  
6 in 36—6 times.

### LESSON 6.

In 400 weeks how many days?

7

Ans. 2800 days.

Place 7, the number of days in a week, under the  
4, and say, 7 times 4 are 28; set down 28, then bring  
down the two ciphers to the right hand of 28.

Answer in words, Two thousand eight hundred.

*Proof of lesson six by Division.*

7)2800

400

Say 7 in 28—4 times—set down 4—7 in 0—0—  
0—0—or

Begin and say, 7 in 28—4 times—set down 4 and place the two ciphers on the right hand side of the 4.

## LESSON 7.

In 9460 dollars of 8 shillings each, how many shillings?

$$\begin{array}{r} 9460 \\ 8 \end{array}$$

Ans. 75680 shillings.

Place the 8 under the 6, take no notice of the cipher till you have multiplied the figures: say 8 times 6 are 48; set down 8 and carry 4—8 times 4 are 32, and 4 that I carried are 36—6 and carry 3—8 times 9 are 72, and 3 I carried are 75: now bring down the cipher on the right hand side of the 8.

Answer in words, Seventy-five thousand six hundred and eighty.

*Proof of lesson seventh by Division.*

$$\begin{array}{r} 8 \overline{)75680} \\ 9460 \end{array}$$

Eight in 75—9 times and 3 over—carry the 3 to 6 makes 36—8 in 36—4 times and 4 over—4 on the left side of 8 will make 48—8 in 48—6 times—8 in 0 no times—set 0 on the right of 6.

## LESSON 8.

In 20000 kegs, each containing 9 galls. how many gallons?

$$\begin{array}{r} 20000 \\ 9 \end{array}$$

Ans. 180000 gallons.

Place 9 for a multiplier under the 2, and pay no regard to the ciphers at present: but say 9 times 2 are 18—set down 18 and place as many ciphers on the right of 18 as there are in the multiplicand.

Answer in words, One hundred and eighty thousand.

*Proof of lesson Eighth.*

$$9)160000$$

$$20000$$

Say 9 in 18—2 times—set down 2 and bring down the ciphers on the right side of 2.

† When the multiplier consists of any number of 9s, you may annex as many ciphers to the multiplicand; then from that number subtract the multiplicand; the remainder will be equal to a true product as if you had multiplied.

*Example.*

## LESSON 9.

Multiply 462 by 9.

*Proof of lesson 9.*

$$4620$$

$$462 \text{ subtract,}$$

$$4158$$

$$462$$

$$9 \mid$$

$$4158$$

*See lesson 10 in Multiplication.*

## LESSONS IN SHORT DIVISION.

## † LESSON 1.

$$2) 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 0$$

$$6 \ 1 \ 7 \ 2 \ 8 \ 3 \ 9 \ 4 \ 5$$

## † LESSON 2.

$$3) 9 \ 8 \ 7 \ 6 \ 5 \ 4 \ 3 \ 2 \ 1 \ 0$$

$$3 \ 2 \ 9 \ 2 \ 1 \ 8 \ 1 \ 0 \ 7 \ 0$$

## † LESSON 3.

$$4) 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 0$$

$$3 \ 0 \ 8 \ 6 \ 4 \ 1 \ 9 \ 7 \ 2 \text{ remain } 2$$

## † LESSON 4.

$$5) 9 \ 8 \ 7 \ 6 \ 5 \ 4 \ 3 \ 2 \ 1 \ 0$$

$$1 \ 9 \ 7 \ 5 \ 3 \ 0 \ 8 \ 6 \ 4 \ 2$$

† LESSON 5.

$$\begin{array}{r} 5) 9 \text{ } _2 8 \text{ } _2 7 \text{ } _3 6 \text{ } _5 5 \text{ } _5 4 \text{ } _3 3 \text{ } _2 2 \text{ } _1 1 \text{ } _0 0 \\ \hline 1 \text{ } 6 \text{ } 4 \text{ } 6 \text{ } 0 \text{ } 9 \text{ } 0 \text{ } 5 \text{ } 3 \text{ } 5 \end{array}$$

† LESSON 6.

$$\begin{array}{r} 7) 9 \text{ } _2 8 \text{ } 7 \text{ } 6 \text{ } _6 5 \text{ } _2 4 \text{ } _3 3 \text{ } _2 2 \text{ } _1 1 \text{ } _0 0 \\ \hline 1 \text{ } 4 \text{ } 1 \text{ } 0 \text{ } 9 \text{ } 3 \text{ } 4 \text{ } 7 \text{ } 4 \text{ } 4-2 \text{ remain.} \end{array}$$

† LESSON 7.

$$\begin{array}{r} 8) 9 \text{ } _1 8 \text{ } _2 7 \text{ } _3 6 \text{ } _4 5 \text{ } _5 4 \text{ } _6 3 \text{ } _7 2 \text{ } _1 0 \\ \hline 1 \text{ } 2 \text{ } 3 \text{ } 4 \text{ } 5 \text{ } 6 \text{ } 7 \text{ } 9 \text{ } 0 \text{ } 1-2 \text{ remain} \end{array}$$

† LESSON 8.

$$\begin{array}{r} 9) 9 \text{ } 8 \text{ } _8 7 \text{ } _6 6 \text{ } _5 5 \text{ } _4 4 \text{ } _3 3 \text{ } _2 2 \text{ } _1 0 \\ \hline 1 \text{ } 0 \text{ } 9 \text{ } 7 \text{ } 3 \text{ } 9 \text{ } 3 \text{ } 6 \text{ } 9 \text{ } 0 \end{array}$$

† LESSON 9.

$$\begin{array}{r} 10) 9 \text{ } 8 \text{ } _8 7 \text{ } _7 6 \text{ } _6 5 \text{ } _5 4 \text{ } _4 3 \text{ } _3 2 \text{ } _2 1 \text{ } _0 0 \\ \hline 9 \text{ } 8 \text{ } 7 \text{ } 6 \text{ } 5 \text{ } 4 \text{ } 3 \text{ } 2 \text{ } 1^* \end{array}$$

† LESSON 10.

$$\begin{array}{r} 11) 9 \text{ } 8 \text{ } _{10} 7 \text{ } _8 6 \text{ } _9 5 \text{ } _7 3 \text{ } _7 2 \text{ } _6 1 \text{ } _6 0 \text{ } _5 0 \\ \hline 8 \text{ } 9 \text{ } 7 \text{ } 8 \text{ } 6 \text{ } 6 \text{ } 5 \text{ } 5 \text{ } 4-6 \text{ remain} \end{array}$$

LESSON 11.

$$\begin{array}{r} 12) 1 \text{ } 2 \text{ } 3 \text{ } _3 4 \text{ } _{10} 5 \text{ } _9 6 \text{ } 7 \text{ } _7 8 \text{ } _6 9 \text{ } _9 0 \\ \hline 1 \text{ } 0 \text{ } 2 \text{ } 8 \text{ } 8 \text{ } 0 \text{ } 6 \text{ } 5 \text{ } 7-6 \text{ remain} \end{array}$$

† LESSON 12.

$$\begin{array}{r} 11) 1 \text{ } 2 \text{ } _1 3 \text{ } _2 4 \text{ } _2 5 \text{ } _3 6 \text{ } _3 7 \text{ } _4 8 \text{ } _4 9 \text{ } _5 0 \\ \hline 1 \text{ } 1 \text{ } 2 \text{ } 2 \text{ } 3 \text{ } 3 \text{ } 4 \text{ } 4 \text{ } 4-6 \text{ remain.} \end{array}$$

\* Recollect, cutting off a figure divides by 10; and annexing a cipher multiplies by 10. Prove Division by Multiplication;—bring in the remainder, if any, as in lessons 13 and 14.

## LESSON 13.

$$11) \begin{array}{cccccccccc} 9 & 8 & 10 & 7 & 8 & 6 & 9 & 5 & 7 & 4 & 8 & 3 & 6 & 2 & 7 & 1 & 6 & 0 \end{array}$$

---


$$\begin{array}{cccccccccc} 8 & 9 & 7 & 8 & 6 & 7 & 5 & 6 & 4 & -6 & \text{remain.} \end{array}$$

## † LESSON 14.

$$11) \begin{array}{cccccccc} 1 & 0 & 1 & 2 & 0 & 1 & 2 & 0 & 8 & 1 & 4 & 4 & 4 \end{array}$$

---


$$\begin{array}{cccccccc} 9 & 1 & 8 & 2 & 7 & 4 & 0 & -4 & \text{remain.} \end{array}$$

† *Proof of lesson 13.*

$$897867564-6$$

$$11$$

---


$$9876543210$$

† *Proof of lesson 14.*

$$9182740-4$$

$$11$$

---


$$101010144$$

END OF PART SECOND.

# INTRODUCTION TO ARITHMETIC.

## PART II.

CONTAINING

*Tables of Foreign Coins, Compound Addition, a sketch of Decimals, Compound Subtraction, and an*

**EXPLANATION OF CARD NO 16.**



### TABLES OF WEIGHT AND VALUE.

In addition to card No. 12, the following Table of weight and value of Coins in the United States, is inserted for the teacher or reader.

*N. B. dwt. or pwt. stands for Pennyweight: gr. Grain.*

dwt.	gr.		Cents.
4	8	of copper make a Half-Cent, or	.5
8	16	of copper make 1 Cent, or	1.
17	7	of silver make 1 Dollar, or	100.
18	17	do make 1 Crown, or	109.
	27	of British or Portuguese gold	100.
	27½	of French or Spanish gold	100.
4	6	A Spanish Pistole	377.3
4	4	A French Pistole	366.7
5	6	An English Guinea	466.6
5	6	A French Guinea	460.
6	22	A Moidore	600.8
9		A single Johannes	800.
18		A double Johannes	1600.
		A Doubloon	1400.6

The reader will recollect the rule for cutting off the two right hand figures, to make dollars on the left. See page 44.

E\*



## FEDERAL VALUE OF SILVER.

	<i>Cents.</i>
The Pennsylvania Fi'penny bit, or New-York Sixpence	6.25
A half Pistareen	8½
A Dime	10.
One eight of a Dollar, or New-York Shilling	12.5
A Pistareen	17.
An English Shilling	22.2
A Quarter of a Dollar	25.
A Half Dollar	50.
A Dollar	100.
A Crown	109.

## OF GOLD.

A Quarter of an Eagle,	250.
A Half Eagle,	500.
An Eagle is 10 Dollars, or	1000.

By a statement of eminent Teachers, we have information of other foreign Coins valued as follows :

	<i>Cents.</i>
The Pound Sterling,	444.44
of Ireland,	410.25
Pagoda of India,	194.
Tale of China,	148.
Mill-ree of Portugal,	125.
Ruble of Russia,	66.
Rupee of Bengal,	55.5
The Guilder of the United Netherlands,	39.
Mark Banco of Hamburg,	33.5
French Franc,	18.6
Real Plate of Spain,	10.

## COMPOUND ADDITION.

## MONEY.

Place pounds under pounds, shillings under shillings, pence under pence, and farthings under farthings.

Carry at every four in the farthings, at every twelve in the pence, at every twenty in the shillings, and at every ten in the pounds.

When adding farthings, divide their sum total by 4, set the *remainder* in place of farthings, and carry the *quotient* to the pence, because 4 farthings make one penny.

When adding pence, divide their sum total by 12, set the *remainder* in place of pence, and carry the *quotient* to the shillings, because 12 pence make one shilling.

When adding shillings, divide their sum total by 20, set the *remainder* in place of shillings, and carry the *quotient* to the pounds, because 20 shillings make one pound.

## KEY TO CARD No. 13.

## LESSON 1.

£.	s.	d.	
72	13	4	Place the figures regularly on your
89	16	3	slates as represented by the card. Then
21	17	4	begin at the lowermost 3 in the column
32	1	8	of Pence, and say, 3 and 8 are 11, and
61	6	3	4 are 15, and 3 are 18, and 4 are 22 ;
			how many times 12 in 22 ? once, and
			10 over, that is 1 shilling and 10 pence ;
£277	14	10	set down 10, and carry 1 to the shil-
			lings.

*Shillings.*

One that I carry to 6 makes 7, and 1 is 8, and 17 are 25, and 16 are 41, and 13 are 54 ; how many times 20 in 54 ? twice and 14 over, that is, 1 pound 14 shillings ; set down 14, and carry 2 to the pounds.

*Pounds, first column.*

Two that I carry and 1 makes 3, and 2 are 5, and 1 is 6, and 9 are 15, and 2 are 17—7 and carry 1.

*Pounds, second column.*

One that I carry to 6 makes 7, and 3 are 10, and 2 are 12, and 8 are 20, and 7 are 27—set down 27. Answer in words, Two hundred and seventy-seven pounds fourteen shillings and ten pence.

Prove addition by beginning at the top, and reckoning downwards.

## LESSON 2.

£.	s.	d.	q.	
81	19	4	1	Begin with farthings and say,
46	7	3	2	2 and 2 are 4, and 3 are 7, and
31	18	9	3	2 are 9, and 1 is 10; how many
171	11	5	2	times 4 in 10? twice, and 2 over,
320	10	6	2	that is, 2 pence and 2 farthings;
				set down 2, and carry 2 to the
				pence.
£ 652	7	5	2	<i>Pence.</i>

Two that I carry to 6 make 8, and 5 are 13, and 9 are 22, and 3 are 25, and 4 are 29; how many times 12 in 29?—2 times and 5 over, that is, 2 shillings and 5 pence; set down 5, and carry 2 to the shillings.

*Shillings.*

Two to 10 are 12, and 11 are 23, and 18 are 41, and 7 are 48, and 19 are 67; how many times 20 in 67?—3 times, and 7 over, that is, 3 pounds 7 shillings; set down seven, and carry 3 to the pounds.

*Pounds, first column.*

Three to 1 is 4, and 1 is 5, and 6 are 11, and 1 is 12—2 and carry 1.

*Pounds, second column.*

One that I carry to 2 makes 3, and 7 are 10, and 3 are 13, and 4 are 17, and 8 are 25—5 and carry 2.

*Pounds, third column.*

Two that I carry to 3 makes 5, and 1 are 6 ; set down 6.

Answer in words, Six hundred and fifty-two pounds, seven shillings and five pence half-penny.

LECTURE.

Why do we divide farthings by 4 ? Because 4 farthings make 1 penny ; and whatever number of pennies or pence there are, must be added in the pence column.

Why do we divide pence by 12 ? Because 12 pence make one shilling ; and whatever number of shillings there are, must be added in the column of shillings.

Why do we divide shillings by 20 ? Because 20 shillings make one pound ; and whatever number of pounds there are, must be added to the pounds.

Let the Teacher or a senior overseer lecture the classes in this way with other pertinent observations when occasion shall require.

We will now endeavor to manage the shillings by a more easy method.

RULE FOR TEACHERS.

Carry the half to the pounds, that is divide the hundreds and tens by 2 ; carry the quotient to the pounds : if any remainder happen, it will always be a 1, set that 1 in the place of tens, on the left side of the units of shillings.

EXAMPLES.

54 shillings.      
$$\begin{array}{r} 2 \overline{) 54} \\ \underline{108} \end{array}$$
  
£ 2    14

Here I say, 2 in 5—2 times and 1 over ; set the 1 by the 4, makes 14 shillings, and the 2, being the quotient, goes to the place of pounds.

Why do we divide the tens and hundreds by 2 ?

Because the result or answer will be the same as when we divide the whole by 20. Twenty shillings

make one pound; therefore if we divide shillings by 20, the quotient will be pounds, the remainder will be shillings, and pounds must be carried forward to their proper place.

But how does the dividing of the tens and hundreds by 2, give the same result as the dividing by 20?

Because if we omit the units and divide all the figures on the left side of them by 2, it will be the same as to divide by 10 and by 2. For, if we divide any number by 10 and that quotient by 2, the last quotient will be the same as though we had divided by 20. See the following examples of B. and C.

$$\begin{array}{r} \dagger \text{ B. } 20 \overline{) 175} 8 \\ \underline{160} \end{array}$$

$$\dagger \text{ C. } 2 \overline{) 17} 5 \quad \begin{array}{r} 8 \quad 15 \end{array}$$

15 remain.

Here we say in the example B, that there are 8 times 20 in 175, and 15 remain. In the example C, we cut off the right hand 5, which is the same as dividing by 10; then divide 17 by 2, the quotient is 8 and 1 over: the 1 over comes from the place of tens, and must be placed in the place of tens again on the left side of the 5, which will make 15. This is for teachers to communicate, and lecture the pupils.

### KEY TO CARD No. 13.

#### LESSON 3.

£ 158	4	3	0	<i>Farthings.</i> Three and 3 are 6, and 1 are 7, and 2 are 9—4 in 9, twice and 1 over; set down 1 and carry 2 to the pence.
209	6	4	2	
48	10	7	1	
61	8	9	3	
100	9	11	3	
100	0	0	0	
<hr/>				
£ 678	0	0	1	

*Pence.*

Two that I carry to 11 are 13, and 9 are 22, and 7 are 29, and 4 are 33, and 3 are 36—12 in 36—3

times and nothing over: set down 0 and carry 3 to the shillings.

*Shillings.*

Three that I carry to 9 are 12, and 8 are 20, and 10 are 30, and 6 are 36, and 4 are 40—the half of 4 is 2; set down 0 and carry 2 to the pounds.

*Pounds, first column.*

Two that I carry to 1 make 3, and 8 are 11, and 9 are 20, and 8 are 28; set down 8 and carry 2.

*Pounds, second column.*

Two that I carry to 6 are 8, and 4 are 12, and 5 are 17—set down 7 and carry 1.

*Pounds, third column.*

One I carry to 1 makes 2, and 1 are 3, and 2 are 5, and one are 6; set down 6.

Answer in words, Six hundred and seventy-eight pounds one farthing.

KEY TO CARD No. 13.

LESSON 4.

£	s.	d.	q.	
21	6	0	0	In the place of farthings, set down 1, there being no more in the column of farthings.
54	13	0	0	
62	15	0	0	
35	4	2	0	
178	17	3	0	<i>Pence.</i>
55	19	7	1	7 and 3 are 10, and 2 are 12; set down 0 and carry 1 to shillings.
£ 408	15	0	1	

*Shillings.*

Now take the most easy mode to reckon the shillings—go up with the unit firsts, then count the tens downward.

One that I carry to 9 makes 10, and 7 are 17, and 4 are 21, and 5 are 26, and 3 are 29, and 6 are 35,

and 10 are 45, and 10 are 55, and 10 are 65, and 10 are 75; the half of 7 is 3, and 1 over; set the 1 on the left side of the 5 in the place of shillings, which will make 15 shillings, and carry the three to the pounds.

*Pounds, first column.*

Three that I carry to 5 make 8, and 8 are 16, and 5 are 21, and 2 are 23, and 4 are 27, and 1 makes 28—8 and carry 2.

*Pounds, second column.*

Two that I carry to 5 make 7, and 7 are 14, and 3 are 17, and 6 are 23, and 5 are 28, and 2 are 30; 0, and carry 3 to the third column;—3 that I carry and 1 make 4.

Sum total in words, Four hundred and eight pounds, fifteen shillings and one farthing.

KEY TO CARD No. 13.

LESSON 5.

*A Merchant's Memorandum.*

Broadcloth,	£ 548	14	6
Coating,	361	16	4
Chints,	249	3	7
Calico,	185	14	6
<hr/>			
Total,	£ 1345	8	11

*Pence.*

Six and 7 are 13, and 4 are 17, and 6 are 23; how many times 12 in 23? One time and 11 over; set down 11, and carry 1 to the shillings.

*Shillings.*

One to 4 makes 5, and 3 are 8, and 6 are 14, and 4 are 18, and 10 are 28, and 10 are 38, and 10 are 48; the half of 4 is 2; set down 8, and carry 2 to the pounds.

*Pounds, first column.*

Two that I carry to 5 are 7, and 9 are 16, and 1 are 17, and 8 are 25—5 and carry 2.

*Pounds, second column.*

Two I carry to 8 make 10, and 4 are 14, and 6 are 20, and 4 are 24—4 and carry 2.

*Pounds, third column.*

Two I carry and 1 makes 3, and 2 are 5, and 3 are 8, and 5 are 13; set down 13.

Total in words, One thousand three hundred and forty-five pounds, eight shillings and eleven pence.

## KEY TO CARD No. 13.

## LESSON 6.

*A Bill of articles bought of a merchant.*

4 Yards of Fustian at 4s. 6d.	£0 18 0 0
9 do. of Velvet, 9s. 4½d.	4 4 2 1
16 Pounds of Nails, 1s. 2d.	0 18 8 0
5 Gallons of Wine, 12s. 4d.	3 1 8 0
4 Bushels of Salt, 7s. 5d.	1 9 8 0
6 Pounds of Coffee, 2s.	0 12 0 0
3 do. Hyson Tea, 9s. 3d.	1 7 9 0

Amount, £12 11 11 1

As there is only one farthing in the column of farthings, set down 1, and begin with the

*Pence.*

Nine and 8 are 17, and 8 are 25, and 8 are 33, and 2 are 35; how many times 12 in 35?—2 times and 11 over; set down 11 and carry 2 to the shillings.

*Shillings.*

Two that I carry to 7 are 9, and 2 are 11, and 9 are 20, and 1 are 21, and 8 are 29, and 4 are 33, and 8 are 41, and 10 are 51, and 10 are 61, and 10 are 71; the half of 7 is 3 and 1 over; set 1 by the left



side of the other 1, makes 11, and carry 3 to the pounds.

*Pounds.*

Three I carry and 1 are 4, and 1 are 5, and 3 are 8, and 4 are 12; set 12 for pounds.

Amount in words, Twelve pounds, eleven shillings, and eleven pence one farthing.

KEY TO CARD No. 13.

LESSON 7.

*A Farmer's Bill.*

Sold 10 fat Oxen, at £ 18	12s.	£ 186 0 0 0
4 Calves,	45s.	9 0 0 0
15 Sheep,	17s. 6d.	13 2 6 0
12 Store hogs,	25s. 3d.	15 3 0 0
4 fat Swine,	135s. 5d.	27 1 8 0
33 bushels of Oats,	2s.	3 6 0 0
25 do. Rye,	6s. 5d.	8 0 5 0

Amount, £ 261 13 7 0

As there are no farthings, begin with the

*Pence.*

Five and 8 are 13, and 6 are 19; how many times 12 in 19? once 12 in 19, and 7 over; set down 7 and carry 1 to the shillings.

*Shillings.*

One I carry to 6 makes 7, and 1 are 8, and 3 are 11, and 2 are 13—this number being under 20, or less than 20, set down 13.

*Pounds.*

Eight and 3 are 11, and 7 are 18, and 5 are 23, and 3 are 26, and 9 are 35, and 6 are 41—1 and carry 4.

*Pounds, second column.*

Four I carry to 2 are 6, and 1 are 7, and 1 are 8, and 8 are 16—6 and carry 1.

One that I carry to 1, in the third column, makes 2 ; set down 2.

Amount in words, Two hundred and sixty-one pounds, thirteen shillings and seven pence.

## KEY TO CARD No. 14.

## LESSON 8.

*A Shipper's Memorandum.*

	£.	s.	d.	q.
Paid for House Insurance,	784	13	9	0
Ship Washington, do.	867	14	2	0
Duties on the cargo,	962	13	8	0
Wharfage,	42	11	3	0
Repairs,	250	17	11	0
A balance due for goods,	946	10	4	1

Amount, £3855 1 1 1

Set 1 in the place of farthings, and proceed to the

*Pence.*

Four and 11 are 15 and 3 are 18, and 9 are 26, and 2 are 28, and 9 are 37; how many times 12 in 37? 3 times and 1 over; set down 1 and carry 3 to the shillings.

*Shillings.*

Three I carry to 7 are 10, and 1 are 11, and 3 are 14, and 4 are 18, and 3 are 21, and 10 are 31, and 10 are 41, and 10 are 51, and 10 are 61, and 10 are 71, and 10 are 81; the half of 8 is 4; set down the 1, and carry 4 to the pounds.

*Pounds, first column.*

Four I carry to 6 are 10, and 2 are 12, and 2 are 14, and 7 are 21, and 4 are 25—5 and carry 2.

*Pounds, second column.*

Two I carry to 4 are 6, and 5 are 11, and 4 are 15, and 6 are 21, and 6 are 27, and 8 are 35—5 and carry 3.

*Pounds, third column.*

Three I carry and 9 are 12, and 2 are 14, and 9 are 23, and 8 are 31, and 7 are 38; set down 38.

Amount in words, Three thousand eight hundred and fifty-five pounds, one shilling, one penny, and one farthing.

### KEY TO CARD No. 14.

#### FEDERAL MONEY.

*One Hundred Cents make One Dollar.*

#### LESSON 9.

Write down in figures, Lesson 9, as you see it on the Card, excepting the lower line.

That is, write as I read, and look at the card for a pattern.

Seven hundred eighty-six cents, one tenth of a cent.\*—Four hundred sixty-nine cents, two tenths—Three hundred forty-one cents, three tenths—Seven hundred eighty-four cents, four tenths—Eight hundred seventy-seven cents, five tenths—Four hundred eighty-six cents, six tenths—Six hundred twenty-one cents, seven tenths.

Now add in the same manner you add whole numbers:—Carry 1 for every 10.

#### *First column.*

Seven and 6 are 13, and 5 are 18, and 4 are 22, and 3 are 25, and 2 are 27, and 1 are 28; set down 8 under the tenths and carry 2—make a period on the left side of 8—This is called eight tenth parts of a cent.

\* Place a *period* between the cents and tenths of cents. This *period* is called units in *Decimals*; it is used to separate whole numbers from decimals. We will know more respecting this subject in a few days.

*Second column.*

Two I carry and 1 are 3, and 6 are 9, and 7 are 16, and 4 are 20, and 1 are 21, and 9 are 30 and 6 are 36—6 and carry 3.

*Third column.*

Three I carry and 2 are 5, and 8 are 13, and 7 are 20, and 8 are 28, and 4 are 32, and 6 are 38, and 8 are 46—6 and carry 4.

*Fourth column.*

Four I carry to 6 are 10, and 4 are 14, and 8 are 22, and 7 are 29, and 3 are 32, and 4 are 36, and 7 are 43; set down 43.

## KEY TO CARD No. 14.

Begin at the period and count two figures to the left; cut these two figures off with a fine perpendicular stroke—Those on the left are dollars, and the two cut off to the right, are cents.

Sum total in words, Forty-three dollars, sixty-six cents, and eight tenths of a cent; or, Four thousand, three hundred and sixty-six cents, eight tenths.

## LESSON 10.

*Cents.*

4 8 6 .8

6 4 2 .9

3 6 4 .5

4 6 8 .7 5\*

6 4 2 .6

5 4 4 .4

6 8 1 .3

Set down 5 at the right hand of tenths; then begin with 3 tenths.

Three and 4 are 7, and 6 are 13, and 7 are 20, and 5 are 25, and 9 are 34, and 8 are 42; set down 2, make a period on the left side of it, and carry 4 to the whole numbers.

*First column of whole numbers.*

3 8|3 1 .2 5

Four I carry, and 1 are 5, and 4 are 9, and 2 are 11, and 8 are 19, and 4 are 23, and 2 are 25, and 6 are 31;—1 and carry 3.

\* See pages 43 and 44.

*Second column of whole numbers.*

Three I carry, and 8 are 11, and 4 are 15, and 4 are 19, and 6 are 25, and 6 are 31, and 4 are 35, and 8 are 43;—3 and carry 4.

*Third column of whole numbers.*

Four I carry, and 6 are 10, and 5 are 15, and 6 are 21, and 4 are 25, and 3 are 28, and 6 are 34, and 4 are 38; set down 38.

Sum total in words. Three thousand eight hundred and thirty-one cents, and twenty-five hundredths of a cent: or, cut off the two right hand figures of whole numbers, and those on the left will be dollars. See the card.

## KEY TO CARD No. 14.

## LESSON 11.

*First column.*

<i>Cents.</i>	Five and 5 are 10, and 5 are 15;
8 6 7 .2 5	set down 5 and carry 1.

*Second column.*

5 4 9 .5	<i>Second column.</i>
6 7 2 .7 5	One I carry to 5 is 6, and 5 are 11,
8 4 4 .2 5	and 2 are 13, and 7 are 20, and 5 are
6 5 4 .5	25, and 2 are 27; set down 7, make
4 6 1 .5	your period and carry 2 to the next.
7 6 2 .	

*Third column.*

4 8   1 1 .7 5	<i>Third column.</i>
----------------	----------------------

Two I carry to 2 are 4, and 1 are 5, and 4 are 9, and 4 are 13, and 2 are 15, and 9 are 24, and 7 are 31—1 and carry 3.

*Fourth column.*

Three I carry to 6 make 9, and 6 are 15, and 5 are 20, and 4 are 24, and 7 are 31, and 4 are 35, and 6 are 41; 1 and carry 4.

*Fifth column.*

Four I carry to 7 are 11, and 4 are 15, and 6 are 21, and 8 are 29, and 6 are 35, and 5 are 40, and 8 are 48; set down 48.

Sum total in words, Four thousand eight hundred and eleven cents, and seventy-five hundredths of a cent.

Cut off the two right hand figures of any number of cents—those on the left will be dollars.

KEY TO CARD No. 14.

LESSON 12.

<i>Cents.</i>	<i>First column.</i>
1 3 4 1 .2	Five and 1 are 6, and 2 are 8, and
2 4 6 1 .2	2 are 10; set down nought and
1 4 6 0 .1	carry 1.
0 3 4 8 .5	
0 2 1 9 .0	<i>Second column.</i>
0 4 0 0 .0	One I carry to 6 makes 7, and 9
4 9 1 6 .0	are 16, and 8 are 24, and 1 are 25,
	and 1 are 26—6 and carry 2.
1 1 1   4 6 .0	

*Third column.*

Two I carry to 1 make 3, and 1 are 4, and 4 are 8, and 6 are 14, and 6 are 20, and 4 are 24—4 and carry 2.

*Fourth column.*

Two I carry and 9 are 11, and 4 are 15, and 2 are 17, and 3 are 20, and 4 are 24, and 4 are 28, and 3 are 31—1 and carry 3.

*Fifth column.*

Three I carry and 4 are 7, and 1 are 8, and 2 are 10, and 1 are 11; set down 11.

Sum total in words, Eleven thousand one hundred and forty-six cents; or, One hundred and eleven dollars and forty-six cents.

## KEY TO CARD No. 14.

## LESSON 13.

<i>Cents.</i>	<i>First column.</i>
7 0 1 .	Five and 5 are 10 ; set down
4 8 0 9 .2 5	nought, that is, nothing, but carry
4 5 .	1 to the next.
6 4 .	<i>Second column.</i>
2 0 1 .5	One I carry to 7 makes 8, and
8 6 0 0 .	5 are 13, and 2 are 15 ; set down
1 4 4 2 0 .7 5	5 and carry 1.
	<i>Third column.</i>
2 8 8 4 1 .5 0	One I carry to 1 makes 2, and 4
	are 6 and 5 are 11 and 9 are 20 and 1 are 21—1 and
	carry 2.

*Fourth column.*

Two I carry and 2 are 4, and 6 are 10, and 4 are 14—4 and carry one.

*Fifth column.*

One I carry and 4 are 5, and 6 are 11, and 2 are 13, and 8 are 21, and 7 are 28—8 and carry 2.

*Sixth column.*

Two I carry and 4 are 6, and 8 are 14, and 4 are 18—8 and carry 1 to the 1 in the seventh column, makes 2 ; set down 2.

Sum total in words, Twenty-eight thousand eight hundred and forty-one cents, and five tenths of a cent,

## LESSON 14.

*A Farmer's Memorandum.*

	<i>Dollars.</i>
Bought 1 Farm,	3450.
100 Turnpike shares, at \$25.	2500.
15 Young cattle, 8.	120.
4 Yoke of Oxen, 72.	288.
3 Horses, 64.	192.
150 Sheep, 1.375	206.25
57 Shares in Bank, 20.	1140.
<b>Amount of the Memorandum,</b>	<b>\$7896.25</b>

Set down 25 in the place of cents, and begin with the dollars.

*First column.*

Six and 2 are 8, and 8 are 16—6 and carry 1.

*Second column.*

One I carry to 4 makes 5, and 9 are 14, and 8 are 22, and 2 are 24, and 5 are 29—9 and carry 2.

*Third column.*

Two I carry to 1 are 3, and 2 are 5, and 1 are 6, and 2 are 8, and 1 are 9, and 5 are 14, and 4 are 18—8 and carry 1.

*Fourth column.*

One I carry and 1 are 2, and 2 are 4, and 3 are 7 ; set down 7.

Amount of the memorandum in words, Seven thousand eight hundred and ninety-six dollars, and twenty-five hundredths of a dollar.

N. B. .25 hundredths, equal one quarter—.5 tenths, equal one half—.75 hundredths, equal three quarters.

Show or teach the class how to write the above note on slates, together with the following

**OBSERVATIONS :**

† The origin of *tens*, hundreds, &c, in decimals may be explained thus :—Suppose any object or thing is divided into ten equal parts ; then one of those parts will be one tenth, or, .1 ; two of them will be two tenths, or .2 ; five of them will be five tenths, or, .5 &c. with a period on the left.

Again, if any thing be divided into 100 parts, then one tenth will be equal to ten of those parts ; two tenths will be equal to twenty of the same parts ; three tenths will be thirty of those parts &c, five of those parts will be equal to five hundredths, or .05, that is five hundredths of a whole thing, as five cents make five hundredths of a dollar ; ten cents will make one tenth, or, .1 of a dollar ; fifteen cents will



make one tenth and five hundredths of a dollar, written thus .15; twenty cents will make twenty hundredths of a dollar, thus, .20 or two tenths, thus .2; twenty-five cents will make twenty-five hundredths of a dollar, and as there are 4 times 25 in 100, consequently 25 is one fourth part of 100, and when written decimally will stand thus .25—When numerating call the period *units*.

By these items the Teacher may proceed and make further observations, as the case may require.

### QUESTIONS

*Applied in Compound Addition of Dollars and Cents.*

† 1. A owes B £34 16s. 8d. C £14 11s. 2d. D £16 8s. 9d. E £42 12s. 4d. ; How much does A owe in the whole ?

Answer £108 8s. 11.

† 2 James wishing to enter into the mercantile business, made an inventory of his estate thus :—A farm \$1020, neat cattle and sheep \$241 and 45 cents, swine \$24 and 50 cents, household furniture \$321 and 25 cents, and wheat \$52 and 31 cents ; how many dollars and cents did his estate amount to in the whole ?

Answer \$1659 and 51 cents.

Farm	1020 00 cents.
Neat cattle and sheep,	241 45
Swine,	24 50
Furniture,	321 25
Wheat,	52 31

---

\$1659|51

Remember, by adding two ciphers to any number of dollars, it will reduce the dollars into cents: and, by cutting off two figures on the right hand of cents, you will make dollars of those figures on the left.

† 3. A borrowed a sum of money, and paid at one time, \$44.32, at another time \$52.61, on a third time \$54.20, and when examining his memorandums, found that \$48 and 87 cents were yet due ; what was the sum borrowed ?

Answer \$200.

† 4. I bought 4 yards of cloth at \$4.25 each yard, 3 bushels of salt at 75-cents a bushel, and one pound of tea for 87.5 cents; how much was my bill?

Answer 2012.5 cents, or \$2012.5 cents.

† 5. John and James in partnership bought a quantity of goods: John paid £13 17 8 for broadcloth, £3 6 4 for calico, £118 6 2 for salt, and £34 5 10 for hollow ware: James paid for Indigo £16 8 0, for steel, £5 6 3, for Swede's iron £50 16 6, and for muslins £20 3 0; what was the amount of their bill?

Answer £262 9 9.

† 6. A father left to his oldest son \$462 37.5 cents, to the second Son \$348 87.5 cents, to the third, twice as much as to the first, and to the fourth, three times the sum of the second; what was the whole sum bequeathed by the father. Ans. \$2782 62.5 cents.

† 7. A merchant's memorandum for a day stands thus:—Received in cash of A, \$3.25, of B, \$13 06.25 cents, of C, \$19.28, of D, \$5.75, of E, \$4.50, of F, \$10 37.5 cents, and of G, in wheat, rye and Indian-corn, \$40 37.5 cents; as entered on Blotter, page 48; how much was received that day?

Answer \$96 59.25 cents.

See lesson 11 and 13.—Addition of Decimals.

† 8. A Butcher paid for oxen \$305.50, for calves \$35.75, for sheep \$200.25, and for salt \$22.50; how much did he pay in the whole? Ans. \$564.

† 9. A. & B. entering into trade made an inventory:—A had \$340.75, in cash, and \$642.25 in sundries named in said inventory:—B had \$503.25 in cash, and a farm valued at \$2020; to what sum did their schedule amount? Ans. \$3506.25.

† 10. A man owed a sum of money, and when he paid \$352.65 there was due \$160.50; what sum did he owe at first? Ans. \$513.15.

## † COMPOUND SUBTRACTION,

Teaches how to take small sums of several denominations from larger sums of the same kind.

## KEY TO CARD No. 15.

## LESSON 1.

Borrowed,	£782 14 6 1
, Paid,	691 11 3 2

---

Due, £ .91 3 2 3

Begin with the 3 farthings and say, 2 from one I cannot—borrow 4 and add to the 1, makes 5 ; now say, 2 from 5 and 3 remain ; set down 3 and carry 1 to the pence.

*Pence.*

One I borrowed and 3 make 4—4 from 6 and 2 remain ; set down 2 : and because I did not borrow, I will not carry any to the shillings.

*Shillings.*

11 from 14, and 3 remain ; set down 3.

*Pounds.*

One from 2 and 1 remains ; set down 1—9 from 8 I cannot ; borrow 10 and add to 8 makes 18—9 from 18, and 9 remain ; set down 9 and carry 1—one I borrowed I carry to 6 makes 7—7 from 7 and nought remains—place a period . under the 6.

The sum due in words, Ninety-one pounds, three shillings and two pence, three farthings.

## KEY TO CARD No. 15.

## LESSON 2.

Borrowed,	£664 17 3 2
Paid, -	375 18 4 3

---

Remains due, £288 18 10 3

Begin with the 3 in the farthings and say, 3 from 2 I cannot ; borrow 4 and add to the 2 makes 6—3

from 6 and 3 remain ; set down 3 and carry 1 to the pence.

*Pence.*

One I carry to 4 makes 5—5 from 3 I cannot ; borrow 12—12 and 3 are 15—5 from 15, and 10 remain ; set down 10, and carry 1 to the shillings.

*Shillings.*

One I carry to 18 are 19—19 from 17 I cannot ; borrow 20 and add to 17, makes 37—19 from 37, and 18 remain ; set down 18 and carry 1 to the pounds.

*Pounds.*

One I carry to 5 makes 6—6 from 4 I cannot ; borrow 10 and say, 6 from 14 and 8 remain ; set down 8 and carry 1.

One I carry to 7 makes 8—8 from 6 I cannot ; borrow 10 and say, 8 from 16 and 8 remain ; set down 8 and carry 1.

One I carry to 3 makes 4—4 from 6 and 2 remain ; set down 2.

Remains due in words, the sum of, Two hundred and eighty-eight pounds, eighteen shillings and ten pence, three farthings.

KEY TO CARD No. 15.

LESSON 3.

Lent	£361	16	3	2
Received,	48	16	4	1

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Due, £312 19 11 1

Now proceed in a different mode of subtracting.

*Farthings.*

1 from 2 and 1 remains ; set down 1.

*Pence.*

Four from 3 I cannot, but from 12 and 8 remain—8 and 3 are 11 ; set down 11 and carry 1 to the shillings.

*Shillings.*

One I carry to 16 makes 17—17 from 16 I cannot, but 17 from 20 and 3 remain—3 and 16 are 19; set 19 in the shillings, and carry 1 to the pounds.

*Pounds.*

One to 8 makes 9—9 from 11 and 2 remain; carry 1 to 4 makes 5—5 from 6 and 1 remains—nothing from 3 and 3 remain.

Answer in words, Three hundred and 12 pounds, nineteen shillings, eleven pence, and one farthing.

## KEY TO CARD No. 15.

## LESSON 4.

From the sum of £1000	0	0	0
Take	145	11	0 2

---

The difference is £854 8 11 2

*Farthings.*

Two from cipher I cannot, but 2 from 4, the number of farthings in a penny, and 2 remain—set down 2 and carry 1, because 1 borrowed 4 farthings equal to 1 penny.

*Pence.*

One I carry to cipher makes one—1 from 0 I cannot; borrow 12, the number of pence in a shilling, and say, 1 from 12 and 11 remain—set down 11 and carry 1.

*Shillings.*

One I borrowed and 11 makes 12—12 from 0 I cannot; borrow 20, the number of shillings in a pound, and say, 12 from 20 and 8 remain—set down 8 and carry 1.

*Pounds.*

One I borrowed, to 5, is 6—6 from 0, I cannot; borrow 10 and say, 6 from 10 and 4 remain; set down 4 and carry 1.

One I carry to 4 makes 5—5 from 0 I cannot;

borrow 10 and say, 5 from 10 and 5 remain—set down 5 and carry 1.

One I carry to 1 makes 2—2 from 10, and 8 remain; set down 8.

The difference in words is, Eight hundred and fifty-four pounds, eight shillings and eleven pence, half-penny.

### KEY TO CARD No. 15.

#### LESSON 5.

<i>Dollars. Cents.</i> 84668—25.5 33768—75.7 <hr style="width: 100%;"/> 50899—49.8	Seven from 5 I cannot, but 7 from 15 and 8 remain; set down 8 with a period on the left side, and carry 1 to the next. One I carry to 5 makes 6—6 from 5, I cannot, but 6 from 15 and 9 remain; set down 9 and carry 1.
---	--

One to 7 makes 8—8 from 2 I cannot, but 8 from 12 and 4 remain; set down 4 and carry one.

One I carry to 8 makes 9—9 from 8 I cannot, but 9 from 18 and 9 remain; set down 9 and carry one.

One I carry to 6 makes 7—7 from 6 I cannot, but 7 from 16 and 9 remain: set down 9 and carry one.

One I carry to 7 makes 8—8 from 6 I cannot, but 8 from 16 and 8 remain; set down 8 and carry one.

One I carry to three makes 4—4 from 4, 0 remains—set down 0—3 from 8 and 5 remain; set down 5.

The difference in words is, Fifty thousand eight hundred and ninety-nine dollars, forty-nine cents and eight tenths of a cent.

### KEY TO CARD No. 15.

#### LESSON 6.

<i>Dollars. Cents.</i>	
From 87654—37.5	
Take 33654—75.	

---

The difference is 53999—62.5

Nought from 5 and 5 remain ; set down 5—5 from 7 and 2 remain ; set down 2.

Seven from 3 I cannot, but 7 from 13 and 6 remain—set down 6 and carry one.

One I carry to 4 makes 5—5 from 4 I cannot, but 5 from 14 and 9 remain—set down 9 and carry one.

One I carry to 5 makes 6—6 from 5 I cannot, but 6 from 15 and 9 remain—set down 9 and carry one.

One I carry to 6 makes 7—7 from 6 I cannot, but 7 from 16 and 9 remain—set down 9 and carry one.

One I carry to three makes 4—4 from 7 and 3 remain ; set down 3.

Three from 8 and 5 remain—set down 5.

The difference in words is, Fifty-three thousand, nine hundred and ninety-nine dollars, sixty-two cents, and five tenths of a cent.

### KEY TO CARD No. 15.

#### LESSON 7.

#### *Memorandum.*

Received 8th May, 1834, the several following sums :

	<i>Dollars. Cents.</i>
From Government,	221855—25.
From New-York,	378650—37.5
From Pennsylvania,	183210—50.
From Baltimore,	134765—75.
Amounting to	916481—87.5
Paid out in manner as follows :	
To the surgeon General,	312750—48.5
To American Invalids,	156375—24.25
To British invalids,	156375—24.25
Paid out in all,	\$625500—97.00

What sum remains on hand ?

First take the several sums received—add them on your slates—then add the sums paid out.

Begin with the sums received—set down .5 tenths; make your period.

*Now begin with the second column.*

Five and seven are 12, and 5 are 17; set down 7 and carry one.

*Third column.*

One I carry to 7 makes 8, and 5 are 13, and 3 are 16, and 2 are 18—8 and carry one.

*Fourth column.*

One I carry to 5 makes 6, and 5 are 11—set down 1 and carry one.

*Fifth column.*

One I carry to 6 makes 7, and 1 are 8, and 5 are 13, and 5 are 18—8 and carry one.

*Sixth column.*

One I carry to 7 makes 8, and 2 are 10, and 6 are 16, and 8 are 24—set down 4 and carry two.

*Seventh column.*

Two I carry to 4 are 6, and 3 are 9, and 8 are 17, and 1 are eighteen—8 and carry one.

*Eighth column.*

One I carry to 3 makes 4, and 8 are 12, and 7 are 19, and 2 are 21—1 and carry two.

*Ninth column.*

Two I carry and 1 are 3, and 1 are 4, and 3 are 7, and 2 are 9—set down 9.

Amount of money received, Nine hundred and eighteen thousand, four hundred and eighty-one dollars, eighty-seven cents and five tenths of a cent.

Now add the money paid out.

*First column.*

Five and 5 are 10—0 and carry one.

*Second column.*

One I carry to 2 makes 3, and 2 are 5, and 5 are 10—set down 0 with a period and carry one.



sum of \$700, their difference is \$568.20; how much is the least sum?

Answer, \$131 80.

### † LESSON 11.

What is the difference between \$10,000 and eleven hundred and eleven dollars and eleven cents?

Answer, \$8888.89.

### † LESSON 12.

If a man has a salary of \$25,000 a year, and he pays out for clerk's wages \$1500, servants \$500, flour \$280, coarse meal, \$125, meat 115, two pipes of wine of 115 gallons each, amounting to \$690, clothes \$400, coffee 100 wt. \$33, tea \$39, sugar 300 wt. \$37.50, and for sundry other articles to the amount of \$1250; how much of his salary will he lay up at the year's end?

Answer, \$20050.50.

### † LESSON 13.

Suppose a gentleman has a salary of \$25,000 per annum, the nett profits of his farm are \$5000 yearly, and his expenses amount to \$4949.50; what are his yearly profits?

Answer, \$25050.50.

#### ADDITION.

5	and	3	are	8
5	and	6	are	11
5	and	4	are	9
5	and	8	are	13
6	and	7	are	13
8	and	3	are	11
7	and	5	are	12
9	and	4	are	13
10	and	6	are	16
11	and	7	are	18
9	and	6	are	15
5	and	11	are	16
12	and	7	are	19
13	and	5	are	18
15	and	9	are	24

#### SUBTRACTION.

3	from	8,	remain	5
6	from	11,	remain	5
4	from	9,	remain	5
8	from	13,	remain	5
7	from	13,	remain	6
3	from	11,	remain	8
5	from	12,	remain	7
4	from	13,	remain	9
6	from	16,	remain	10
7	from	18,	remain	11
6	from	15,	remain	9
11	from	16,	remain	5
7	from	19,	remain	12
5	from	18,	remain	13
9	from	24,	remain	15

## LECTURING.

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13	and	7	are	20	7	from	20,	remain	13
14	and	6	are	20	6	from	20,	remain	14
14	and	9	are	23	9	from	23,	remain	14
17	and	8	are	25	8	from	25,	remain	17
16	and	5	are	21	5	from	21,	remain	16
15	and	8	are	23	8	from	23,	remain	15
19	and	9	are	28	9	from	28,	remain	19

## MULTIPLICATION.

Twice	12	are	24	8	times	9	are	72
3 times	12	are	36	8	times	5	are	40
6 times	7	are	42	8	times	8	are	64
6 times	9	are	54	8	times	12	are	96
7 times	8	are	56	8	times	4	are	32
7 times	9	are	63	10	times	12	are	120
5 times	3	are	15	11	times	7	are	77
5 times	7	are	35	11	times	5	are	55
5 times	9	are	45	10	times	11	are	110
4 times	12	are	48	12	times	11	are	132
4 times	11	are	44	11	times	11	are	121

## DIVISION.

3	in	15	5	times	9	in	72,	8	times
5	in	40	8	times	11	in	44,	4	times
5	in	55	11	times	11	in	110,	10	times
7	in	42	6	times	11	in	132,	12	times
7	in	35	5	times	11	in	121,	11	times
7	in	77	11	times	4	in	32,	8	times
8	in	56	7	times	12	in	24,	2	times
8	in	64	8	times	12	in	36,	3	times
9	in	54	6	times	12	in	48,	4	times
9	in	63	7	times	12	in	96,	8	times
9	in	45	5	times	12	in	120,	10	times

The monitor will form questions from the foregoing key in the following manner.

## ADDITION.

How many are 19 and 9? How many are 15 and 8? How many are 16 and 5?

**SUBTRACTION.**

Nine from 28, how many remain? Eight from 23 how many remain?

**MULTIPLICATION:**

How many are 11 times 11? How many are 12 times 11?

**DIVISION.**

How many times 11 in 121? He must begin with the head of the class, and proceed as in spelling: For instance, No. 1, How many are 19 and 9? If he answer right let him retain his place; if not, let the first boy that answers the question correctly, have precedence.

NOTE.—I begin at the bottom of the page, because there the numbers will form more difficult questions than those at the top, and generally the best scholars are near the head of the class.

I do this to encourage those toward the foot of the class, who are not so ready as others: For if a boy can answer and say, 5 and 3 make 8, he will be better pleased than to answer with a negative shake of the head. This partiality, however, is not allowable when striving for a prize.

**END OF PART SECOND.**

# INTRODUCTION TO ARITHMETIC.

## PART III.

CONTAINING

### COMPOUND MULTIPLICATION.



#### COMPOUND MULTIPLICATION.

KEY TO CARD No. 17.

##### LESSON 1.

If 1 yoke of oxen, cost	£32 16 8 2
what will 2 yoke cost ?	2

Answer,

£65 13 5 0

*Operation in words.*

Begin with the farthings, and say, twice 2 are 4—4 farthings make one penny; set down 0 and carry the 1 penny to the pence.

*Pence.*

Twice 8 are 16, and one 1 carried makes 17—17 pence make one shilling and five pence; set down 5 and carry 1 to the shillings.

*Shillings.*

Twice 6 are 12, and 1 1 carried are 13; set down 3 in unit's place of shillings, and carry 1; then say, twice 1 is 2, and one 1 carried are 3—the half of 3 is 1, and 1 over—set the 1 over on the left side of the 3, and carry the half to the pounds.

*Pounds.*

Twice 2 are 4, and one 1 carried makes 5; set down 5.

Twice 3 are 6—set down 6.

Answer in words, sixty-five pounds, thirteen shillings, and five pence.

*Proof of Lesson first by Division.*

Write down in figures, 
$$\begin{array}{r} 2)65\ 13\ 5\ 0 \\ 32\ 16\ 8\ 2 \end{array}$$

Prepare your work as you see it on the Card, under proof of Lesson 1.

Then say, how many times 2 in 6?—3 times; set down 3 and say, how many times 2 in 5?—twice and 1 over; set down 2 on the right hand side of the 3, and call the 1 over, 1 pound, which makes 20 shillings to carry to the shillings.

*Shillings.*

Twenty shillings I carry from the pounds to 13 make 33 shillings—how many times 2 in 33?—16 times and 1 over; set down 16.

*Pence.*

One over I carry from the shillings makes 12 pence, and 5 pence are 17; how many times 2 in 17?—8 times and 1 over; set down 8 and carry the 1 to the farthings.

*Farthings.*

One penny over I carry makes 4 farthings, how many times 2 in 4?—twice; set down 2

Proof in words, Thirty-two pounds, sixteen shillings, and eight pence, half penny.

**KEY TO CARD NO. 17.****LESSON 2.**

If 1 yard of cloth cost £2 5 6 1  
what sum will 3 yards cost? 3

Answer, £6 16 6 3

*Farthings.*

Three times 1 makes 3; set down 3.

*Pence.*

Three times 6 are 18—18 pence make 1 shilling and 6 pence; set down the 6 pence, and carry the 1 shilling.

*Shillings.*

Three times 5 are 15, and one I carry makes 16 ; set down 16 shillings.

*Pounds.*

Three times 2 are 6 ; set down 6 pounds.

Answer in words, Six pounds, sixteen shillings, and six pence, three farthings.

*Proof of Lesson 2.*

Write in figures £6 16 6 3, place a 3 before pounds as on the card.

$$\begin{array}{r} 3)6 \quad 16 \quad 6 \quad 3 \\ 2 \quad 5 \quad 6 \quad 1 \end{array}$$

*Pounds.*

How many times 3 in 6 ? 2 and nothing over ; set down 2.

*Shillings.*

How many times 3 in 16 ?—5 times, and 1 over I carry to the pence.

*Pence.*

One shilling over I carried, makes 12 pence, and 6 are 18 ; how many times 3 in 18 ?—6 times ; set down 6.

*Farthings.*

How many times 3 in 3 ? once ; set down 1.

Proof in words, Two pounds five shillings, and six pence farthing.

## KEY TO CARD No. 17.

## LESSON 3.

If one load of wheat, cost £16 16 11 2 what will 4 loads cost ?

Answer, £67 7 10 0

*Farthings.*

Four times 2 are 8—8 farthings make 2 pence ; set down 0 and carry 2 to the pence.

H

*Pence.*

Four times 11 are 44, and 2 I carried make 46—46 pence are 3 shillings and 10 pence; set down 10, and carry 3 to the shillings.

*Shillings.*

Four times 6 are 24, and 3 I carried are 27—set 7 in the units of shillings and carry 2—4 times 1 is 4, and 2 I carried are 6, the half of 6 is 3, carry 3 to the pounds.

*Pounds.*

Four times 6 are 24, and 3 I carried are 27—set down 7 and carry 2.

Four times 1 are 4, and 2 I carried are 6.

Answer in words, Sixty-seven pounds, seven shillings and ten pence.

*Proof of Lesson 3.*

4)67	7	10	0	{ Prepare your work as on the Card.
16	16	11	2	

*Pounds.*

Four in 6 once, and 2 over; set down 1 and carry the 2 to the left side of the 7, makes 27—4 in 27—6 times, and 3 over I carry to the shilling—set down 6.

*Shillings.*

Three pounds over I carried, make 60 shillings, and 7 make 67—how many times 4 in 67?—say 4 in 6—once and 2 over—4 in 27—6 and 3 over; by this you find 16 times 4 in 67, and 3 over; set down 16 and carry 3 to the pence.

*Pence.*

Three shillings over I carried, make 36 pence, and 10 make 46; how many times 4 in 46?—11 times and 2 over—set down 11, and carry 2 to the farthings.

*Farthings.*

Two pence over I carried, make 8 farthings; how many times 4 in 8?—twice; set down 2 and the work is done.

Proof in words, Sixteen pounds sixteen shillings and eleven pence half-penny.

KEY TO CARD No. 17.

LESSON 4.

Bought 5 waggons at £24 17 4 3 each, what did the whole cost ?

Answer, £124 6 11 3

*Farthings.*

Five times 3 are 15—15 farthings, are 3 pence and 3 farthings over ; set down 3 and carry the 3 pence to the pence.

*Pence.*

Five times 4 are 20 and 3 I carried are 23—23 pence are 1 shilling and 11 pence ; set down 11 and carry 1 to the shillings.

*Shillings.*

Five times 7 are 35, and one I carried is 36 ; set down 6 and carry 3—5 times 1 is 5, and three I carried are 8, the half of 8 is 4, which I carry to the pounds.

*Pounds.*

Five times 4 are 20, and 4 I carried are 24 ; set down 4 and carry 2—5 times 2 are 10, and 2 I carried are 12 ; set down 12.

Answer in words, One hundred and twenty-four pounds, six shillings eleven pence three farthings.

*Proof of lesson four.*

*Prepare your work.*

5)124 6 11 3  
24 17 4 3

*Pounds.*

Five in 12—twice and 2 over ; set down 2 and carry 2 to the left side of the 4, makes 24—5 in 24—4 times and 4 over ; set down 4 and carry 4 to the shillings.



*Shillings.*

Four pounds over I carried make 80 shillings, and 6 make 86 : how many times 5 in 86 ?—say five in 8—1 and 3 over—5 in 36—7 times and 1 over ; here you find 17 times 5 in 86 and 1 over—set down 17, and carry the 1 to the pence.

*Pence.*

One shilling over I carried makes 12 pence, and 11 make 23—5 in 23—4 times and 3 over ; set down 4 and carry 3 to the farthings.

*Farthings.*

Three I carried from the pence make 12 farthings, and 3 are 15 ; how many times 5 in 15 ? 3 times ; set down 3.

Proof in words, Twenty-four pounds seventeen shillings and four pence three farthings.

## LESSON 5.

When I hire a man at £0 7 11 1 a day, what sum will his hire amount to 6 in 6 days ?

---

£2 7 7 2

*Farthings.*

Six times 1 are 6—6 farthings make 1 penny 2 farthings ; set down 2 and carry one to the pence.

*Pence.*

Six times 11 are 66, and one I carried are 67—67 pence are 5 shillings and 7 pence ; set down 7 and carry 5 to the shillings.

*Shillings.*

Six times 7 are 42, and 5 I carried are 47—47 shillings make 2 pounds 7 shillings ; set down 7 and carry 2 to the pounds.

Answer in words, Two pounds seven shillings and seven pence half-penny.

*Proof of lesson five.*

6)2 7 7 2  
7 11 1

*Pounds.*

Six in 2 I cannot—carry the 2 to the shillings.

*Shillings.*

Two pounds I carried make 40 shillings, and 7 are 47—6 in 47—7 times, and 5 over I carry to the pence.

*Pence.*

Five shillings over I carried make 60 pence, and 7 make 67; how many times 6 in 67?—11 times and one over I carry to the farthings; set down 11.

*Farthings.*

One penny over I carried, makes 4 farthings, and 2 are 6; how many times 6 in 6?—once; set down one.

# KEY TO CARD No. 17.

## LESSON 6.

Bought 7 yards of broadcloth at £2 7 8 1 a yard,  
what is the amount? 7

Answer, £16 13 9 3

*Farthings.*

Seven times 1 is 7—7 farthings make 1 penny 3 farthings; set down 3 and carry one to the pence.

*Pence.*

Seven times 8 are 56 and one I carried makes 57—57 pence make 4 shillings and 9 pence; set down 9 and carry 4 to the shillings.

*Shillings.*

Seven times 7 are 49 and 4 I carried are 53—53s. make 2 pounds 13 shillings; set down 13 and carry 2 to the pounds.

*Pounds.*

Seven times 2 are 14 and 2 I carried are 16; set down 16.

H\*

Answer in words, Sixteen pounds thirteen shillings and nine pence three farthings.

*Proof of lesson sixth.*

7)16 13 9 3

*Pounds.*

2 7 8 1

How many times 7 in 16?—twice, and 2 over; set down 2 and carry 2 to the shillings.

*Shillings.*

Two that I carried from the pounds make 40 shillings, and 13 make 53—how many times 7 in 53? 7 times and 4 over; set down 7 and carry 4 to the pence.

*Pence.*

Four shillings over I carried make 48 pence, and 9 are 57; how many times 7 in 57? Eight times and one over; set down 8 and carry one to the farthings.

*Farthings.*

One penny over I carried makes 4 farthings, and 3 are 7; how many times 7 in 7? Once; set down 1.

Proof in words, Two pounds seven shillings and eight pence, farthing.

KEY TO CARD No. 17.

LESSON 7.

If 1 load of sole leather cost £80 14 6 2  
what will 8 loads cost? 8

Answer, £645 16 4 0

*Farthings.*

Eight times 2 are 16—16 farthings make 4 pence; set down 0 and carry 4 to the pence.

*Pence.*

Eight times 6 are 48, and 4 that I carried are 52—52 pence make 4 shillings and 4 pence; set down the 4 pence, and carry the 4 shillings to the shillings.

*Shillings.*

Eight times 4 are 32, and 4 I carried are 36—6 and carry 3—8 times 1 is 8, and 3 are 11: the half of 11 is 5 and 1 over; set the 1 on the left of 6, and carry the 5 to the pounds.

*Pounds.*

Eight times 0 is 0, and 5 I carried are 5; set down 5 and carry nothing.

Eight times 8 are 64; set down 64.

Answer in words, Six hundred and forty-five pounds sixteen shillings and four pence.

*Proof of lesson seventh.*

$$\begin{array}{r} 8)645\ 16\ 4\ 0 \\ \underline{80\ 14\ 6\ 2} \end{array}$$

How many times 8 can I have in 64? 8 times; set down 8 under the 4.

How many times 8 in 5? 0 times; set down 0 under the 5, and carry the 5 to the shillings.

*Shillings.*

Five pounds I carried, make 100 shillings, and 16 make 116; how many times 8 in 116? Place 116 in a memorandum on some part of your slate, and say, 8 in 11—once; set down 1, then 3 over place by 6, will make 36—8 in 36—4 times and 4 over to carry to the pence; thus you find 14 times 8 in 116, and 4 over.

*Pence.*

Four shillings I carried, make 48 pence, and 4 make 52; how many times 8 in 52? 6 times and 4 over; set down 6 and carry 4 to the farthings.

*Farthings.*

Four pence I carried, make 16 farthings—8 in 16—twice; set down 2.

Proof in words, Eighty pounds, fourteen shillings, and six pence, half-penny.

## KEY TO CARD No. 17.

## LESSON 8.

What will 9 days' masoning cost at £0 10 4 2  
per day ? 9

Answer, £4 13 4 2

*Farthings.*

Nine times 2 are 18—18 farthings make 4 pence 2 farthings ; set down 2 and carry 4 to the pence.

*Pence.*

Nine times 4 are 36, and 4 I carried are 40—40 pence are 3 shillings and 4 pence ; set down 4 and carry 3 to the shillings.

*Shillings.*

Nine times 10 are 90, and 3 I carry are 93—93 shillings make four pounds, 13 shillings ; set down 13 in the place of shillings, and 4 in the place of pounds.

Answer in words, Four pounds 13 shillings and four pence half-penny.

*Proof of lesson eighth.*

9)4 13 4 2  
10 4 2

Here I cannot have 9 in 4, but I say, 4 pounds make 80 shillings, and 13 make 93: then I say, how many times 9 in 93? 10 times, and 3 over ; set down 10 in the place of shillings, and carry 3 to the pence.

*Pence.*

Three shillings I carried, make 36 pence, and 4 make 40—how many times 9 in 40? 4 times and 4 over ; set 4 in the place of pence, and carry 4 to the farthings.

*Farthings.*

Four pence I carried make 16 farthings, and 2 are 18—how many times 9 in 18? twice ; set down 2, in the place of farthings.

KEY TO CARD No. 18.

LESSON 9.

When wheat is sold at £0 14 4 2 a bushel, what must I pay for 10 bushels?

£0 14 4 2

10

£7 3 9 0

*Farthings.*

Ten times 2 are 20—20 farthings make 5 pence; set down 0 and carry 5 to the pence.

*Pence.*

Ten times 4 are 40, and 5 I carried are 45—45 pence are 3 shillings and 9 pence; set down 9 and carry 3 to the shillings.

*Shillings.*

Ten times 4 are 40, and 3 I carried are 43; set down 3 and carry 4—10 times 1 are 10 and 4 are 14—the half of 14 is 7—carry 7 to the pounds.

*Pounds.*

Ten times 0 is 0, but 7 I carried make 7; set down seven.

Answer in words, Seven pounds three shillings and nine pence.

*Proof of lesson nine.*

10)7 3 9 0

14 4 2

Ten in 7 I cannot, but 7 pounds will make 140 shillings, and 3 will make 143—how many times 10 in 143? 14 times and 3 over; set down 14 and carry 3 to the pence.

*Pence.*

Three shillings over that I carried, make 36 pence, and nine are 45—how many times 10 in 45? 4 times; set down 4 and 5 over I carry to the farthings.

*Farthings.*

Five pence I carried make 20 farthings—how many times 10 in 20? twice; set down 2.

## KEY TO CARD No. 18.

## LESSON 10.

If the cost of clearing 1 acre of land amount to  
£6 17 3 3 what will 11 acres cost?

11

*Farthings.*


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 £75 10 5 1

Eleven times 3 are 33—33 farthings are 8 pence 1 farthing; set down 1 and carry 8 to the pence.

*Pence.*

Eleven times 3 are 33, and 8 1 carried are 41—41 pence make 3 shillings and 5 pence; set down 5 and carry 3 to the shillings.

*Shillings.*

Eleven times 7 are 77, and 3 1 carried are 80—set down 0 and carry 8—11 times 1 is 11, and 8 are 19; the half of 19 is 9 and 1 over; set 1 on the left side of 0 and carry 9 to the pounds.

*Pounds.*

Eleven times 6 are 66, and 9 that 1 carried are 75: set down 75.

Answer in words, Seventy-five pounds, ten shillings, and 5 pence, one farthing.

*Proof of lesson tenth.*

11)75 10 5 1

*Pounds.*

£6 17 3 3 How many times 11 in 75? 6 times and 9 over; set down 6, and carry 9 to the shillings: now 9 pounds must be reduced into shillings, and added to the 10 shillings.

*Shillings.*

Twenty shillings make 1 pound, and 9 pounds make 180 shillings—This you may know by multiplying 20 by 9 on some part of your slate, thus,

20

9

---

 180

then add the 10 shillings, which will make 190 shillings: now how many times 11 in 190? make a memorandum on some part of your slate, and divide 190 by 11—we can have 17 times and 3 over; set down 17 in the place of shillings, and carry 3 to the pence.

*Pence.*

Three shillings over that I carried, are 36 pence, and 5 are 41—how many times 11 in 41—3 times and 8 over—set down 3 and carry 8 to the farthings.

*Farthings.*

Eight pence over I carried make 32 farthings, and 1 makes 33—how many times 11 in 33?—3 times; set down 3.

## KEY TO CARD No. 18.

## LESSON 11.

When geese are sold at £1 16 4 2 a dozen,  
what must I give for 12 doz. ? 12

Answer, £21 16 6 0

*Farthings.*

Twelve times 2 are 24—24 farthings make 6 pence; set down 0 and carry 6 to the pence.

*Pence.*

Twelve times 4 are 48, and 6 I carried are 54—54 pence are 4s. 6d.; set down 6 pence, and carry 4s. to the shillings.

*Shillings.*

Twelve times 6 are 72, and 4 I carried are 76—6 and carry 7—12 times 1 are 12, and 7 are 19—the half of 19 is 9, and 1 over; set down 1 on the left side of 6, and carry 9 to the pounds.

*Pounds.*

Twelve times 1 is 12, and 9 are 21; set down 21.

Answer in words, Twenty-one pounds sixteen shillings and six pence.





*Shillings.*

Twelve times 6 are 72, and 8 I carried are 80—0 and carry 8—12 times 1 are 12, and 8 are 20—the half of 20 is 10—carry 10 to the pounds.

*Pounds.*

Twelve times 4 are 48, and 10 I carried are 58; set down 8 and carry 5.

Twelve times 1 is 12 and 5 are 17; set down 17. To this sum, add the price of 1 barrel.

Answer in figures, £192 17 2 2.

Answer in words, One hundred and ninety-two pounds seventeen shillings and two pence half penny.

*Proof of lesson 12.*

Subtract the price of one barrel, from £192 17 2 2, and divide the remainder by 12.

£192 17 2 2

14 16 8 2 Subtracted.

---

£178 0 6 0 to be divided by 12

12)178 0 6 0

14 16 8 2

*Pounds.*

How many times 12 in 17? once and 5 over—12 in 58?—4 times, and 10 over—carry 10 to the shillings.

*Shillings.*

Ten pounds over I carried, make 200 shillings; how many times 12 in 200?—16 times, and 8 over; set down 16, and carry 8 to the pence.

*Pence.*

Eight shillings over I carried, make 96 pence; and 6 are 102—how many times 12 in 102?—8 times and 6 over; set down 8, and carry 6 to the farthings.

*Farthings.*

Six pence over I carried, make 24 farthings—how many times 12 in 24? twice; set down 2.

Proof, £14 16 8 2.

## KEY TO CARD No. 18.

## LESSON 13.

What will 14 Oxen cost at the rate of £17 6 8 an ox?

Multiply this given sum by 2 and that product by 7.

$$\begin{array}{r} £17 \ 6 \ 8 \\ \times 2 \\ \hline \end{array} \qquad \begin{array}{r} £34 \ 13 \ 4 \\ \times 7 \\ \hline \end{array}$$

$$\begin{array}{r} £34 \ 13 \ 4 \\ \times 7 \\ \hline \end{array} \qquad \begin{array}{r} £242 \ 13 \ 4 \text{ Answer,} \\ \times 2 \\ \hline \end{array}$$

*Pence.*

Twice 8 are 16—16 pence make 1s. 4d. ; set down 4, and carry 1 to the shillings.

*Shillings.*

Twice 6 are 12 and one I carried makes 13 ; set down 13.

*Pounds.*

Twice 17 are 34 ; set down 34.

Thus we have the price of 2 oxen ; and as 7 times 2 are 14 ; so 7 times the price of 2 oxen, will give the price of 14.

Multiply £34 13 4, the price of 2, by 7.

*Pence.*

$$\begin{array}{r} £242 \ 13 \ 4 \\ \times 7 \\ \hline \end{array} \qquad \begin{array}{r} \text{Seven times 4 are } 28 \\ \text{pence are } 28 \end{array}$$

28 pence are 2s. 4d. ; set down 4 and carry 2 to the shillings.

*Shillings.*

Seven times 3 are 21—and 2 I carried are 23—3 and carry 2—7 times 1 is 7, and 2 are 9—the half of 9 is 4 and 1 over ; set down 1 on the left side of 3, and carry 4 to the pounds.

*Pounds.*

Seven time 4 are 28, and 4 I carried are 32 ; set down 2 and carry 3. Seven times 3 are 21, and 3 I carried are 24 ; set down 24.

Answer in figures, £242 13 4. In words, Two hundred and forty-two pounds thirteen shillings and four pence.

*Proof of Lesson 13.*

Divide £242 13 4, the price of the oxen, by 7, and that quotient by 2. The last quotient will be the proof.

$$\begin{array}{r} 7)242 \ 13 \ 4 \\ 34 \ 13 \ 4 \end{array}$$

$$\begin{array}{r} 2)34 \ 13 \ 4 \\ 17 \ 6 \ 8 \end{array}$$

*First division.*

How many times 7 in 24? 3 times and 3 over—7 in 32?—4 times, and 4 over I carry to the shillings.

*Shillings.*

Four pounds over I carried makes 80s. and 13s. make 93—how many times 7 in 93?—13 times, and 2 over—carry 2 to the pence.

*Pence.*

Two shillings over I carried, Make 24 pence, and 4 are 28—7 in 28?—4 times.

*Second division.*

How many times 2 in 34?—17 times.

*Shillings.*

How many times 2 in 13?—6 times and 1 over I carry to the pence.

*Pence.*

One shilling over I carried, is 12 pence, and 4 are 16—2 in 16?—8 times.

## KEY TO CARD No. 18.

## LESSON 14.

Multiply £461 17 4 by 15.

Multiply this given sum by 5, and that product by 3, the last product will be the answer.

As 5 times 1 is 5, and 3 times 5 are 15; so any number, multiplied by 5 and by 3, will produce a product 15 times greater than such number.

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## EXAMPLE.

£461	17	4		£2309	6	8	
		5				3	
<hr/>				<hr/>			
£2309	6	8		£6928	0	0	

*Pence.*

Five times 4 are 20—20 pence are 1s. 8d.; set down 8, and carry 1 to the shillings.

*Shillings.*

Five times 7 are 35, and one 1 carried makes 36—6 and carry 3—5 times 1 is 5, and 3 are 8—the half of 8 is 4—carry 4 to the pounds.

*Pounds.*

Five times 1 is 5, and 4 I carried are 9—set down 9—5 times 6 are 30—0 and and carry 3—5 times 4 are 20, and 3 are 23.

*Second Multiplication.*

Three times 8 are 24—24 pence make 2 shillings; set down 0 and carry 2 to the shillings.

*Shillings.*

Three times 6 are 18, and 2 are 20; set down 0 and carry one to the pounds, because 20s. make one pound.

*Pounds.*

Three times 9 are 27 and one I carried makes 28—8 and carry 2—3 times 0 is 0, but 2 is 2; set down 2—3 times 3 are 9—9 and carry nothing—3 times 2 are 6.

Answer in words, Six thousand nine hundred and twenty-eight pounds.

## KEY TO CARD No. 18.

## LESSON 15.

What sum will be produced by multiplying

*Directions.*

£0 18 9 by 16?

Multiply 18s. 9d. by 4, and that product by 4, the last product will be the answer.

4	£0 18 9
3 15 0	
4	
	£ 15 0

*Pence.*

Four times 9 are 36—36 pence are 3 shillings; set down 0 and carry 3 to the shillings.

*Shillings.*

Four times 8 are 32, and 3 I carried are 35—5 and carry 3—4 times 1 are 4, and 3 are 7—the half of 7 is 3, and one over; set one by the 5, and carry 3 to the pounds.

*Pounds.*

Four times 0 is 0, but 3 I carried make 3. Thus for the first product we have £3 15.

*Second Multiplying.*

Four times 15 are 60—60 shillings make 3 pounds; set down 0 and carry 3 to the pounds.

*Pounds.*

Four times 3 are 12, and 3 I carried are 15. Answer in words, Fifteen pounds.

## KEY TO CARD No 18.

## LESSON 16.

If one pound of Indigo cost £0 19 6, what will 17 pounds cost?

Multiply by 4 and by 4, you will then have the price of 16 pounds—add the price of 1 pound, which will give the answer.

£0 19 6 Price of 1 lb. or Multiplicand.  
4 First Multiplier.

---

3 18 0 First Product—price of 4 lbs.  
4 Second Multiplier.

---

15 12 Second product—price of 16 lbs.  
19 6 Price of 1 lb. added.

---

£16 11 6 Price of 17 lbs.

*Pence.*

Four times 6 are 24—24 pence make 2 shillings; set down 0 and carry 2 to the shillings.

*Shillings.*

Four times 9 are 36 and 2 I carried are 38—8 and carry 3—4 times 1 are 4 and 3 are 7—the half of 7 is 3 and one over; set one by 8 and carry 3 to the pounds.

*Pounds.*

Four times 0 is nothing, but 3 I carried are 3; set 3 in the pounds.

*Second Multiplying.*

*Shillings.*

Four times 8 are 32—2 and carry 3—4 times 1 is 4, and 3 are 7—the half of 7 is 3 and 1 over; set 1 by the 2, and carry 3 to the pounds.

*Pounds.*

Four times 3 are 12, and 3 I carried are 15; set down 15.

We have for a product, £15 12 0  
Add to this the price of 1 lb. viz. 19 6

---

Answer, £16 11 6

† Attend again to an explanation of multiplying by parts of a multiplier. Suppose we multiply the digit 1, by 4, the product will be 4: then multiply that product by 4, and the second product will be 16—

## REMARKS.

† The first product is 4 times greater than the first figure 1; and the same product being multiplied by 4, produces a product 4 times 4 times or 16 times greater than the first figure 1. Therefore any number first multiplied by 4, and then that product by 4, will produce a number 16 times greater than the first.

Again multiply any number by 4, and the product thence arising by 5, the result will be the same as when you multiply by 20. Multiply by 7 and by 3, the last product will be the same as though you had multiplied by 21. Multiply by 11 and by 2 will make 22; by 6 and by 4 will make 24; by 3 and by 9 will make 27; by 7 and by 4 will make 28; by 10 and by 3 will make 30; and by 8 and by 4 will make 32, &c. &c.

## KEY TO CARD No. 19.

## LESSON 17.

If a yard of linen cost 5s. 9d. what will 35 yards cost?

Multiply by 7, and the product thence arising by 5; the last product will be the answer.

£0 5 9		Begin with the Pence—7 times 9
— 7		are 63—63 pence are 5s. 3d.—set
2 0 3		down 3 and carry 5 to the shillings.
— 5		<i>Shillings.</i>
£10 1 3		Seven times 5 are 35, and 5 I carried are 40—40s. make 2 pounds; set
		down 0 in the place of shillings, and 2 in the place of pounds.

This operation gives a product of £2 0 3, which is 7 times greater than the given sum, and it must be multiplied by 5; then it will be 5 times 7 times greater, or 35 times greater.

*Pence.*

Five times 3 are 15—15 pence make 1s. 3d.—set down 3 and carry 1 to the shillings.



*Shillings.*

Five times 0 is 0, but one 1 carried makes 1; set down 1—then say, 5 times 2 are 10, and set down 10 in the pounds.

Answer in words, Ten pounds one shilling and 3 pence.

## KEY TO CARD No. 19.

## LESSON 18.

When apples are sold at 1*d.* 1*q.* what will 700 cost? Multiplying by 10 and that product by 10 will make the price of 100; then the price of 100 multiplied by 7, will give the answer.

£ 0 0 1 1

10

1 0 2

10

10 5 0

7

£ 3 12 11

*Farthings.*

Ten times 1 is 10—10 farthings make 2 pence 2 farthings; set down 2 and carry 2 to the pence.

*Pence.*

Ten times 1 is 10, and 2 1 carried make 12—12 pence make 1 shilling; set down 0 in the place of pence, and 1 in the place of shillings. Thus 1*s.*

0*d.* 2*q.* is the product of 1*d.* 1*q.* multiplied by 10: now multiplying this sum by 10—the product will be the price of 100.

*Farthings.*

Ten times 2 are 20—20 farthings make 5 pence; set down 0 in the place of farthings, and carry 5 to the pence.

*Pence.*

Ten times 0 is 0, but 5 1 carried make 5; set down 5.

*Shillings.*

Ten times 1 is 10—set down 10.

Now we have a product of 10*s.* 5*d.* the price of 100. Multiply this by 7.

**Pence.**

**Seven times 5 are 35—35 pence make 2s. 11d.; set down 11, and carry 2 to the shillings.**

**Shillings.**

**Seven times 10 are 70, and 2 I carried are 72—  
72s. make 3 pounds 12 shillings; set 12 in the place  
of shillings, and 3 in the pounds.**

By this calculation we find, that 700 apples, at 1d. 1q. each, amount to £3 12 11.

**Answer in words, Three pounds twelve shillings and eleven pence.**

**KEY TO CARD No. 19.**

## LESSON 19.

**If one pair of gloves cost £0 3 7, what will 57 pair cost?**

**£ 0 3 7**     Multiply by 7 and by 8, then add to  
                   **7**     the last product, 3s. 7d. the price of  
                   one pair.  


---

       **1 5 1**  
                   **8**  


---

       **10 0 8**  
                   **3 7**  


---

**£ 10 4 3**     Seven times 7 are 49—49 pence make  
                   4s. 1d.; set down 1 and carry 4 to the  
                   shillings.  
                                   *Pence.*  
                                   Seven times 3 are 21, and 4 I carried  
                                   make 25—25s. are 1 pound 5 shillings;  
                                   *Shillings.*  
 set down 5 in the place of shillings, and 1 in the  
 pounds.

Thus we see that 7 pair amount to £1 5 1, and as 8 times 7 are 56, so 8 times this sum will give the price of 56 pair.

**Second Multiplication.**

**. Eight times 1 is 8 ; set down 8 in the pence.**

Eight times 5 are 40—40s. make 2 pounds ; set 0 in the place of shillings, and carry 2.

Eight times 1 is 8, and 2 I carry make 10 ; set 10 in the pounds.

This operation produces a product of £10 0 8, the price of 56 pair—add the price of one pair, viz : 3s. 7d. you will have the price of 57 pair.

Answer in words, Ten pounds four shillings and three pence.

### KEY TO CARD No. 19.

#### LESSON 20.

When stockings are sold at £0 7 9 a pair, what will 68 pair come to ?

$$\begin{array}{r}
 £\ 0\ 7\ 9 \\
 \times\ 6 \\
 \hline
 2\ 6\ 6 \\
 11
 \end{array}$$

Multiply by 6 and by 11, this will give the price of 66 pair.

£ 25 11 6 Price of 66 pair.

Now multiply 7s. 9d. the price of one pair, by 2 ; the product will be the price of 2 pair—add this price to that of 66 pair, you will have the answer.

Price of one pair,	£0 7 9
Multiplier,	2

Price of two pair,	£0 15 6
Price of 66 pair,	25 11 6

Price of 68 pair,	£26 7 0 Ans.
-------------------	--------------

*Pence.*

Six times 9 are 54—54 pence make 4s. 6d. ; set down 6 and carry 4 to the shillings.

*Shillings.*

Six times 7 are 42, and 4 I carried are 46—46 shillings are 2 pounds 6 shillings ; set down 6 in the shillings and 2 in the pounds.

Here we find a product of £2 6 6 the price of 6 pair ; Multiply this sum by 11—the product will be the price of 11 times 6 pair, that is 66 pair.

*Pence.*

Eleven times 6 are 66—66 pence are 5s. 6d.; set down 6, and carry 5 to the shillings.

*Shillings.*

Eleven times 6 are 66, and 5 I carried make 71—71 shillings are 3 pounds 11 shillings; set down 11 and carry 3 to the pounds.

*Pounds.*

Eleven times 2 are 22, and 3 I carried are 25.

Thus we have a product of £25 11 6, for the price of 66 pair—Add the price of two pair, you will have the answer.

One Pair,	7s.	9d.
Multiplied by	2	
	<hr/>	
Makes	15s.	6d.

*Pence.*

Twice 9 are 18—18 pence make 1s. 6d.; set down 6 in the pence, and carry 1.

*Shillings.*

Twice 7 are 14, and one I carried makes 15.

Here we find the price of 2 pair to be	£0	15	6
and there the price of 66 pair was,	25	11	6
Added,	<hr/>		
Make,	£26	7	0

Answer in words, Twenty-six pounds, seven shillings.

## KEY TO CARD No. 19.

## LESSON 21.

What sum must be paid for 1155 pounds of beef, at 4d. 2q. a pound?

1. Multiply by 10 and by 10 to find the price of 100 pounds.

2. Multiply that product by 11, which operation will give the price of 1100 pounds.

3. Multiply 4*d.* 2*q.* by 11 and by 5 to find price of 55 pounds.

4. Add the price of 55 pounds to the price of 1*l.* and you will have the answer.

A £0 0 4 2    The price of 1 pound.  
                   10    Multiplied by 10

B        3 9 0    The price of 10 pounds.  
           10    Multiplied by 10.

C        1 17 6    The price of 100 pounds.  
           11    Multiplied by 11.

D    20 12 6    The price of 1100 pounds.

£. s. d. q.  
 Aa 0 0 4 2    The price of 1 pound.  
           11    Multiplied by 11.

E        4 1 2    The price of 11 pounds.  
           5    Multiplied by 5.

F    1 0 7 2    The price of 55 pounds.  
 Dd 20 12 6 0    The price of 1100 pounds  
                   Added to 55 pounds.

G 21 13 1 2    The price of 1155 pounds.

*Farthings opposite A.*

Ten times 2 are 20—20 farthings make 5 pence set down 0 and carry 5 to the pence.

*Pence.*

Ten times 4 are 40, and 5 I carry make 45—pence make 3*s.* 9*d.*; set down 3*s.* 9*d.* which is price of 10 pounds. Now multiply the price of pounds by 10, the product will be the price of 1 pounds.

*Pence opposite B.*

Ten times 9 are 90—90 pence make 7*s.* 6*d.*; down 6 and carry 7.

*Shillings.*

Ten times 3 are 30, and 7 are 37—37s. make 1 pound 17 shillings; set down £1 17. This product is the price of 100—Multiply it by 11 and you will have the price of 1100.

*Pence, opposite C.*

Eleven times 6 are 66—66 pence are 5s. 6d.; set down 6 and carry 5 to the shillings.

*Shillings.*

Eleven times 7 are 77, and 5 I carried are 82—2 and carry 8—11 times 1 is 11, and 8 are 19—the half of 19 is 9 and 1 over; set the 1 in tens' place of shillings, and carry 9 to the pounds.

*Pounds.*

Eleven times 1 is 11, and 9 I carried make 20—set 20 in the place of pounds.

Thus we have £20 12 6 for the price of 1100 pounds.

Now multiply the price of one pound by 11 and by 5, to find the price of 55 pounds—add this price to that of 1100 pounds, and you will have the answer.

*Farthings, opposite A a.*

Eleven times 2 are 22—22 farthings make 5d. 2q.; set down 2 and carry 5.

*Pence.*

Eleven times 4 are 44, and 5 I carried are 49—49d. make 4s. 1d.; set down 1 in the pence and 4 in the shillings.

*Farthings, opposite E.*

Five times 2 are 10—10 farthings make 2 pence 2 farthings; set down 2 and carry 2 to the pence.

*Pence.*

Five times 1 is 5 and 2 I carried are 7—set down 7 in the pence.

*Shillings.*

Five times 4 are 20—20s. make one pound; set down 0 in the shillings, and 1 in the place of pound. This makes £1 0 7 2 for the price of 55 pounds.  
 £1 0 7 2 Price of 55 pounds, added  
 To 20 12 6 0 the price of 1100 pounds.

Makes £21 13 1 2 the answer for 1155 lbs.

Answer in words, Twenty-one pounds thirteen shillings and one penny half-penny.

When an *Integer*, that is, a whole number, costs so much a pound, what will a hundred weight cost?

## RULE.

Multiply the price of one Integer by 7 and by 8, and the second product by 2: the third product will be the price of 112.

NOTE 1st.—A hundred weight Avoirdupois contains 112 pounds; consequently any number being multiplied by 7, and that product by 8, will make a product 56 times the first number; and this second product multiplied by 2, will make a product 112 times greater than the first number.

$$1 \times 7 = 7 \times 8 = 56 \text{ and } 56 \times 2 = 112.$$

Read thus, 1 multiplied by 7 equals 7, multiplied by 8 equals 56; and 56 multiplied by 2 equals 112.

NOTE 2nd.—It will make no difference to multiply by 8 first, then by 7.

## KEY TO CARD No. 19.

## LESSON 22.

## EXAMPLE.

If 1 pound of Indigo cost £0 17 5 what will 112 pounds cost, that is what will one hundred weight Avoirdupois, cost?

£0 17 5 Price of 1 pound.

8

6 19 4 Price of 8 pounds.

7

48 15 4 Price of 56 pounds.

2

£97 10 8 Price of 112 lbs.

5—8 times 1 are 8 and 5 are 13; the half of 13 is 6 and 1 over, place 1 by the 3 and carry 6 to the place of pounds.

This operation makes a product of £6 19 4.—Multiply this sum by 7.

*Pence.*

Seven times 4 are 28—28 pence make 2s. 4d.; set down 4 and carry 2.

*Shillings.*

Seven times 9 are 63, and 2 I carried are 65—5 and carry 6—7 times 1 are 7, and 6 are 13—the half of 13 is 6 and 1 over; set 1 by the 9 and carry 6 to the pounds.

*Pounds.*

Seven times 6 are 42, and 6 I carried are 48; set 48 in the pounds.

This makes a product of £48 15 4 the price of 56 pounds—Multiply this sum by 2.

*Pence.*

Twice 4 are 8; set down 8 and carry nothing—twice 15 are 30—30s. make 1 pound 10 shillings; set down 10 for shillings, and carry one to the pounds.

Twice 8 are 16, and one I carried makes 17; set down 7 and carry one—twice 4 are 8 and 1 makes 9 set down 9.

Thus we have a sum of £97 10 8 for the answer.



## KEY TO CARD No. 19.

## LESSON 23.

When fish come at £0 0 5 a pound, what will a hundred weight cost?

£0 0 5  
8

The price 8 pounds,      0 3 4  
7

The price of 56 pounds,    1 3 4  
2

The price of a 112 lbs.   £2 6 8

*Pence.*

Eight times 5 are 40—40 pence equal 3s. 4d.; set 4 in the pence, and 3 in the shillings.

*Second Operation.*

Seven times 4 are 28—28 pence are 2s. 4d.; set down 4 and carry 2.

Seven times 3 are 21 and 2 are 23; set down £1 3.

Here we have a sum of £1 3 4 for the price of 56 pounds, which sum when multiplied by 2, will give a product for the price of 112 pounds.

*Pence.*

Twice 4 are 8; set down 8 in the pence.

*Shillings.*

Twice 3 are 6; set 6 in the shillings.

*Pounds.*

Twice 1 are 2; set 2 in the pounds.

Answer in words, Two pounds six shillings and eight pence.

END OF PART THIRD.

# INTRODUCTION TO ARITHMETIC.

## PART IV.

CONTAINING

### COMMON MULTIPLICATION.



#### MULTIPLICATION.

#### KEY TO CARD No. 20.

Inform the learners that the number to be multiplied is called the *Multiplicand*.

The number we multiply by, *Multiplier*, and the result or sum total, the *Product*.

Let them also know, that the *Multiplicand* and *Multiplier* are called *Factors*: that is, the upper, and lower, factor; and it makes no difference in the *Product* which number stands uppermost; only place the smallest Factor under for the ease of multiplying.

#### LESSON 1.

Multiplicand, 4 6 4 3 2 upper Factor,  
Multiplier, 5 2 4 lower Factor,

1 8 5 7 2 8	Intermediate
9 2 8 6 4	Products.
2 3 2 1 6 0	

2 4, 3 3 0, 3 6 8 Product.

Here give notice how the figures must be arranged in the several intermediate Products.

Always place the first figure of a product exactly under its Multiplier.

Begin with the 4 the first figure on the right of the Multiplier.

Four times 2 are 8 ; set 8 exactly under the 4—4 times 3 are 12 ; set 2 on the left side of 8 and carry 1—4 times 4 are 16 and one 1 carried makes 17 ; set down 7 and carry 1—4 times 6 are 24 and one 1 carried makes 25 ; set down 5 and carry 2—4 times 4 are 16 and 2 are 18 ; set down 18.

*Second.*

Twice 2 are 4—set 4 under the 2—Twice 3 are 6 ; set six under the 7—Twice 4 are 8 ; set 8 under the 5—Twice 6 are 12 ; set 2 under the 8 above and carry 1—Twice 4 are 8 and one 1 carried makes 9 ; set 9 under the 1.

*Third.*

Five times 2 are 10 ; set 0 under the 6—5 times 3 are 15 and one 1 had to carry make 16—set 6 under the 8 and carry 1—5 times 4 are 20 and one 1 carried makes 21 ; set 1 under the 2 and carry 2—5 times 6 are 30 and 2 1 carried are 32 ; set 2 under the 9 and carry 3—5 times 4 are 20 and 3 1 carried are 23 ; set 23 on the left side of the whole.

Add these three products as in addition of whole numbers.

Eight is 8—4 and 2 are 6—6 and 7 are 13 ; 3 and carry 1—1 to 6 makes 7 and 8 are 15 and 5 are 20—0 and carry 2—2 to 1 is 3 and 2 are 5 and 6 are 13—3 and carry 1—1 to 2 makes 3 and 9 are 12 and 1 is 13—3 and carry 1—1 to 3 makes 4—2 make 2.

Product in words, Twenty-four million three hundred and thirty thousand three hundred and sixty-eight.

Now let each one become expert in reading figures—Let the Numeration Table hang in view.

## KEY TO CARD NO. 20.

## LESSON 2.

Multiplicand, 6 1 2 4 8  
Multiplier, 7 3 2

1 2 2 4 9 6  
1 8 3 7 4 4  
4 2 8 7 3 6

*First.*

Twice 8 are 16—6  
and carry 1—twice 4 are  
8 and 1 is 9—twice 2  
are 4—twice 1 are 2—  
twice 6 are 12.

*Second.*

Product 4 4, 8 3 3, 5 3 6  
—4 and carry 2—3 times 4 are 12 and 2 are 14—4  
and carry 1—3 times 2 are 6 and 1 is 7—3 times 1  
are 3—3 times 6 are 18.

*Third.*

Seven times 8 are 56—6 and carry 5—7 times 4 are  
28 and 5 are 33—3 and carry 3—7 times 2 are 14 and  
3 are 17—7 and carry 1—7 times 1 is 7 and 1 are 8  
—7 times 6 are 42.

*Add these intermediate Products.*

Total product in words, Forty-four million eight  
hundred and thirty-three thousand five hundred and  
thirty-six.

## KEY TO CARD No. 20.

## LESSON 3.

Multiplicand, 1 6 7 3 9  
Multiplier, 2 8 7

1 1 7 1 7 3  
1 3 3 9 1 2  
3 3 4 7 8

*First.*

Seven times 9 are 63—3  
and carry 6—7 times 3 are  
21 and 6 are 27—7 and  
carry 2—7 times 7 are 49  
and 2 are 51—1 and carry  
5—7 times 6 are 42 and 5  
are 47—7 and carry 4—7  
times 1 is 7 and 4 are 11.

Product 4, 8 0 4, 0 9 3

*Second.*

Eight times 9 are 72—2 and carry 7—8 times 3  
are 24 and 7 are 31—1 and carry 3—8 times 7 are  
56 and 3 are 59—9 and carry 5—8 times 6 are 48 and  
5 are 53—3 and carry 5—8 times 1 is 8 and 5 are 13.

*Third.*

Twice 9 are 18—8 and carry 1—Twice 3 are 6 and 1 is 7—7 and carry nothing—Twice 7 are 14—4 and carry 1—Twice 6 are 12 and 1 is 13—3 and carry one—Twice 1 is 2 and 1 is 3.

*Add the intermediate Products.*

Total Product in words, Four million eight hundred and four thousand and ninety-three.

† NOTE :—For our better understanding the nature of multiplication, we will analyze a sum and multiply the component parts by any multiplier we choose, and see if the product will be equal to that produced by the usual mode of multiplying.

$$\begin{array}{r} \text{† Multiplicand, } 4 \ 5 \ 6 \\ \text{Multiplier} \quad 2 \ 4 \\ \hline 1 \ 8 \ 2 \ 4 \\ 9 \ 1 \ 2 \end{array}$$

Product, 1 0 9 4 4 A

$$\begin{array}{r} \text{Multiplier,} \quad 2 \ 4 \\ \text{First component part } 6 \\ \hline \text{1st Product,} \quad 1 \ 4 \ 4 \end{array}$$

$$\begin{array}{r} \text{Multiplier,} \quad 2 \ 4 \\ \text{2d. component part } 5 \ 0 \end{array}$$

$$\begin{array}{r} \text{2d. Product,} \quad 1 \ 2 \ 0 \ 0 \end{array}$$

$$\begin{array}{r} \text{Multiplier,} \quad 2 \ 4 \\ \text{3d component part } 4 \ 0 \ 0 \end{array}$$

$$\begin{array}{r} \text{3d Product,} \quad 9 \ 6 \ 0 \ 0 \end{array}$$

$$\begin{array}{r} \text{† First compo-} \\ \text{nent part } 6 \text{ or units} \\ \text{Second} \quad 5 \ 0 \text{ or tens} \\ \text{Third} \quad 4 \ 0 \ 0 \text{ hundreds.} \end{array}$$

Proof of  
analysis 4 5 6

$$\begin{array}{r} \text{1st Product,} \quad 1 \ 4 \ 4 \\ \text{2nd Product,} \quad 1 \ 2 \ 0 \ 0 \\ \text{3rd. Product} \quad 9 \ 6 \ 0 \ 0 \end{array}$$

Total, 1 0 9 4 4  
equal to the product at A.

By these operations we perceive the necessity of keeping units, tens, hundreds, &c. in their proper places. For, units multiplied by 24 produce a certain sum; tens another sum greater than that of units, and hundreds another, still

greater, and in a ten fold proportion of the distance they stand from units.

From this we see the reason why the intermediate products incline obliquely to the left.

## KEY TO CARD No. 20:

## LESSON 4.

4	5	6	7	
6	5	2	4	
<hr/>				
1	8	2	6	8
9	1	3	4	
2	2	8	3	5
2	7	4	0	2
<hr/>				
2	9	7	9	5, 1 0 8

*First.*

Four times 7 are 28—8 and carry 2—4 times 6 are 24 and 2 are 26—6 and carry 2—4 times 5 are 20 and 2 are 22—2 and carry 2—4 times 4 are 16 and 2 are 18.

*Second.*

Twice 7 are 14—4 and carry 1—twice 6 are 12 and 1 is 13—3 and carry 1—twice 5 are 10 and 1 is 11—1 and carry one—twice 4 are 8 and 1 is 9.

*Third.*

Five times 7 are 35—5 and carry 3—5 times 6 are 30 and 3 are 33—3 and carry 3—5 times 5 are 25 and 3 are 28—8 and carry 2—5 times 4 are 20 and 2 are 22.

*Fourth.*

Six times 7 are 42—2 and carry 4—6 times 6 are 36 and 4 are 40—0 and carry 4—6 times 5 are 30 and 4 are 34—4 and carry 3—6 times 4 are 24 and 3 are 27.

*Add the intermediate Products.*

Total product in words, Twenty-nine million seven hundred and ninety-five thousand one hundred and eight.

## KEY TO CARD No. 21.,

## LESSON 5.

Multiplicand,	4 8 7 6	<i>First figure of the Multiplier.</i>
Multiplier,	6 5 4 3	
	<hr/>	Three times 6 are 18
	1 4 6 2 8	—8 and carry 1—3
	1 9 5 0 4	times 7 are 21 and 1 is
	2 4 3 8 0	22—2 and carry 2—3
	2 9 2 5 6	times 8 are 24 and 2
	<hr/>	are 26—6 and carry 2
Product,	3 1,9 0 3,6 6 8	—3 times 4 are 12 and
		2 are 14.

*Second.*

Four times 6 are 24—4 and carry 2—4 times 7 are 28 and 2 are 30—0 and carry 3—4 times 8 are 32 and 3 are 35—5 and carry 3—4 times 4 are 16 and 3 are 19.

*Third.*

Five times 6 are 30—0 and carry 3—5 times 7 are 35 and 3 are 38—8 and carry 3—5 times 8 are 40 and 3 are 43—3 and carry 4—5 times 4 are 20 and 4 are 24.

*Fourth.*

Six times 6 are 36—6 and carry 3—6 times 7 are 42 and 3 are 45—5 and carry 4—6 times 8 are 48 and 4 are 52—2 and carry 5—6 times 4 are 24 and 5 are 29.

*Add the intermediate products.*

Total product in words, Thirty-one million nine hundred and three thousand six hundred and sixty-eight.

## KEY TO CARD No. 21.

## LESSON 6.

<b>Multiplicand,</b>	5 6 7 8		<i>First.</i>
<b>Multiplier,</b>	8 7 6 5		Five times 8 are 40
	<hr/>		—0 and carry 4—5
	2 8 3 9 0		times 7 are 35 and 4 are
	3 4 0 6 8		39—9 and carry 3—5
	3 9 7 4 6		times 6 are 30 and 3 are
	4 5 4 2 4		33—3 and carry 3—5
	<hr/>		times 5 are 25 and 3
	4 9, 7 6 7, 6 7 0		are 28.

*Second.*

Six times 8 are 48—8 and carry 4—6 times 7 are 42 and 4 are 46—6 and carry 4—6 times 6 are 36 and 4 are 40—0 and carry 4—6 times 5 are 30 and 4 are 34.

*Third.*

Seven times 8 are 56—6 and carry 5—7 times 7 are 49 and 5 are 54—4 and carry 5—7 times 6 are 42 and 5 are 47—7 and carry 4—7 times 5 are 35 and 4 are 39.

*Fourth.*

Eight times 8 are 64—4 and carry 6—8 times 7 are 56 and 6 are 62—2 and carry 6—8 times 6 are 48 and 6 are 54—4 and carry 5—8 times 5 are 40, and 5 are 45.

*Add the intermediate Product.*

Total product in words, Forty-nine million seven hundred and sixty-seven thousand six hundred and seventy.



## KEY TO CARD No. 21,

## LESSON 7.

Multiplicand, 9 8 7 0 0  
 Multiplier, 6 5 4 0

3 9 4 8  
 4 9 3 5  
 5 9 2 2

Product, 6 4 5, 4 9 8, 0 0 0  
 times 9 are 36 and 3 are 39.

Multiply by 4, by 5,  
 and by 6, paying no re-  
 gard to the ciphers.

*First.*

Four times 7 are 28  
 —8 and carry 2—4  
 times 8 are 32 and 2 are  
 34—4 and carry 3—4

*Second.*

Five times 7 are 35—5 and carry 3—5 times 8 are  
 40 and 3 are 43—3 and carry 4—5 times 9 are 45  
 and 4 are 49.

*Third.*

Six times 7 are 42—2 and carry 4—6 times 8 are  
 48 and 4 are 52—2 and carry 5—6 times 9 are 54  
 and 5 are 59.

*Add the intermediate products.*

We have now a total product of 645498—annex  
 the three ciphers, that is, place them on the right  
 hand of these figures and they will make the answer  
 required, viz : 645,498,000.

Product in words, Six hundred and forty-five mill-  
 ion four hundred and ninety-eight thousand.

## KEY TO CARD No. 21.

## LESSON 8.

Multiplicand, 4 0 7 8 0  
 Multiplier, 1 6 0 0

2 4 4 6 8  
 4 0 7 8

Product, 6 5, 2 4, 8 0 0 0

Multiply by the  
 two figures, add  
 the intermediate pro-  
 ducts, then count the  
 ciphers and annex  
 them to the total pro-  
 duct.

*First.*

Six times 8 are 48—8 and carry 4—6 times 7 are 42 and 4 are 46—6 and carry 4—6 times 0 is 0 but 4 is 4—6 times 4 is 24.

*Second.*

Once 8 is 8—once 7 is 7—once 0 is 0, once 4 is 4.

Add—bring down the ciphers.

Total product in words, Sixty-five million two hundred and forty-eight thousand.

## KEY TO CARD No. 21.

## LESSON 9.

9 9 9 0 0	Multiply by the 7.
7 0 0	Seven times 9 are 63—3 and
6 9, 9 3 0, 0 0 0	carry 6—7 times 9 are 63 and
	6 are 69—9 and carry 6—7
	times 9 are 63 and 6 are 69.

Bring down the ciphers—They make Sixty-nine million nine hundred and thirty thousand.

NOTE.—See page 50.

## † LESSON 10.

Multiply 3745 by 99.

374500

3745

Proof, 370755

## † LESSON 11.

345 by 999.

345000

345

344655

## † LESSON 12.

Multiply 243 by 9999

2430000

243

2429757

*Questions applied in Multiplication.*

## † LESSON 13.

How many square rods are in a piece of land 99 rods in length and 45 rods wide? Answer, 4455.

L

## † LESSON 14.

If a floor is 9 feet wide and 36 feet long, how many square feet does it contain? Answer, 315.

## † LESSON 15.

Bought 99 bales of linen, in each bale were 50 pieces, and each piece contained 30 yards; how many yards were in the whole? Answer, 148500.

## † LESSON 16.

A farmer sold 45 oxen at 50 dollars a head, 3 cows at 25 dollars a head, and 99 sheep at 3 dollars a head; what was the amount of the whole? Answer, \$3297.

## † LESSON 17.

Bought 25 bales of broadcloth, each bale contained 15 pieces, and each piece 30 yards; what did the whole cost at 9 dollars a yard? Answer, \$101250.

## † LESSON 18.

If you pay a man 2 dollars a day, what will be the amount of his wages in 4 years, allowing 52 weeks to a year and 7 days to a week, but deducting at the same time 52 days in each year for Sundays? Answer, \$2496.

## † LESSON 19.

How much wine in 13 casks, each containing 115 gallons? Answer, 1495.

## † LESSON 20.

What is the product of 6 dozen dozen, multiplied by half a dozen dozen? Answer, 62208.



## LECTURING.

What do we understand by the word NOTATION?

Notation is the recording or noting any number of objects or things: in Arithmetic it signifies the writing down any number of figures, as 1 2 3 4.

**What is meant by NUMERATION ?**

The act of numbering after figures are noted or written ; for instance, read the figures, 1, 2, 3, and 4, thus, One thousand two hundred and thirty-four.

**What is ADDITION ?**

Addition is the combining of several numbers together, as, 3 more 5, more 6, more 7, equal 21. Or, 3 added to 5, added to 6, added to 7, equal 21 for a **RESULT** or **SUM TOTAL**.

**What do we understand by the word SUBTRACTION ?**

Subtraction is the lessening of any quantity, as the number 15 taken from 20, leaves 5 for a **REMAINDER**.

**What is the arithmetical name of the upper number in Subtraction ?**

Call it **MAJOR**: the middle number we will call **MINOR**, and the lowermost number, **REMAINDER**.

**NOTE.**—This Rule partakes of the nature of Division, as for example, subtract 4 from 24, five times, the *remainder* will be 4, the same as the *quotient* of 24 when divided by 6: that is, 24 less 4, equals 20 ; 20 less 4, equals 16 ; 16 less 4, equals 12 ; 12 less 4, equals 8 ; 8 less 4, equals 4. Or how many times 6 in 24 ? 4 times.

**What is MULTIPLICATION ?**

Multiplication is the increasing of numbers with rapidity, instead of a tedious and slow way of operating by Addition, thus, 5 times 8 are 40 ; instead of 8 and 8 are 16, and 8 are 24, and 8 are 32, and 8 are 40.

**By what name shall we call the terms in this Rule ?**

The number to be multiplied is called **MULTIPPLICAND** ; the number we multiply by, **MULTIPLIER** ; and the lowermost number **PRODUCT**. The Multiplicand and Multiplier are also called **Factors** ; and may be termed upper and lower Factor.

**NOTE.**—When the lower factor consists of several figures, that is, a composite number, there will be more products than one, and they may be called *intermediate products*.

**How shall we define Division ?**

Division is a concise way of working Subtraction, or of appropriating a larger number into smaller and equal parts ; as, 41 dollars divided between 5 men, will give each man 8, and 1 over for a Remainder. This mode is

easier than to subtract from 40 the number 5 eight times to find an answer.

What are the names of the terms in Division?

The number we divide by, is called **DIVISOR**; that which we divide, **DIVIDEND**; the result, or answer, **QUOTIENT**; and if any thing be left undivided, it is a **REMAINDER**.

Classes may lecture in this manner on some day appointed, and the most expert may be entitled to precedence as in spelling.

**END OF PART FOURTH.**

# INTRODUCTION TO ARITHMETIC.

## PART V.

### CONTAINING LONG DIVISION.



### LONG DIVISION. KEY TO CARD No. 23.

#### LESSON 1.

In 79,392 ounces Avoirdupois, how many pounds, owing 16 ounces to each pound?

79392(4962

64

153

144

..99

96

. 32

32

—

..

NOTE.—16 is the *Divisor*.

79392 is the *Dividend*.

4962 is the *Quotient*.

When any number of figures remain in the place of the two periods under 32, such number will be called the *Remainder*.

Let the Division Table, Card No. 22, be suspended before the class.

The overseer will direct the class to prepare their lesson on the slates, as it is represented on card No. 23.

Then say, how many times 16 in 79? Look at table under 16—Begin at the last number opposite 16, that is, 144; count upwards till you find a number less than 79, say 64—opposite 64 you will find 4 times—Then say, I can have 4 times 16 in 79; 4 in the quotient.

Now multiply 16 by 4, and place the product under

Four times 6 are 24—4 and carry 2—4 times 1 are 4 and 2 are 6—thus we have 64 standing under 79—  
 Subtract this number 64 from 79—the remainder is 15.

Bring down the next figure in the dividend, that is, 3, and place it on the right hand side of 15, which will make 153.

Now say, how many times 16 in 153?

Look at the last number in the table under 16, which is 144, opposite that stands 9 times—as 144 is less than 153. I find that 16 will be contained 9 times in 153; set 9 in the quotient.

Multiply the divisor 16 by 9, and set the product under 153.

Nine times 6 are 54—4 and carry 5—9 times 1 are 9 and 5 are 14.

Thus we have the number 144 under 153.

Subtract this number 144 from 153. The remainder is 9.

Bring down the next figure from the dividend, that is, 9, which will make 99.

How many times 16 in 99?

Begin at the lowermost number under 16 in the table, say, 144, and look upwards till you find a number less than 99, let it be 96—opposite 96 stands 6 times.

Set 6 in the quotient, and multiply 16 by 6.

Six times 6 are 36—6 and carry 3—6 times 1 are 6 and 3 are 9.

Thus we have 96 standing under 99.

Subtract 96 from 99—the remainder is 3.

Bring down the next and last figure in the dividend, viz. 2, which makes 32.

How many times 16 in 32?

The Table tells you twice 16 is 32.

Place 2 in the quotient, and multiply 16 by 2.

Twice 6 are 12—2 and carry 1—Twice 1 are 2 and 1 are 3.

Thus we have 32 standing under 32.

Subtract 32 from 32 and 0 remains—place 2 periods under 32, as you see on the Card.

The figures in our quotient amount to 4962, which is the answer to the question.

How many times 16 in 79392? Ans. 4962 times.

If 16 ounces make 1 pound, then 32 ounces will make 2 pounds; because we can have twice 16 in 32.

Forty-eight ounces make 3 pounds; because we can have 3 times 16 in 48.

Sixty-four ounces make 4 pounds; because we can have 4 times 16 in 64.

Eighty ounces make 5 pounds; because we can have 5 times 16 in 80.

And 79392 ounces make 4962 pounds; because we can have 4962 times 16 in 79392.

Let the class write these observations several times on their slates. They will thereby obtain an idea of a part, and by degrees understand the whole.

As the spears of grass and herbs, imperceptibly make their daily growth; so our knowledge increases by small portions, till we become masters of many valuable arts.

# KEY TO CARD No. 23.

## LESSON 2.

If 48297 cents are to be divided between 17 boys, how many may each one have?

17)48297(2841

34

—

142

136

—

.. 69

68

—

17

17

—

..

*First.*

I say how many times 17 in 48? twice; set 2 in the quotient, and multiply the divisor by 2—the product is 34, which place under 48; then subtract 34 from 48, and there remain 14—bring down the next figure from the dividend, viz. 2, and place it on the right hand side of 14, which makes 142.

*Second.*

How many times 17 in 142? by the Table I find 8 times; set 8 in the



quotient, and multiply 17 by 8—place the product under 142—subtract, and 6 remain.

Now bring down the next figure 9 from the dividend, and place it on the right of 6, makes 69.

*Third.*

How many times 17 in 69? 4 times; set 4 in the quotient, and multiply the divisor 17 by 4—place the product under 69—subtract it from 69 and there remains 1—to the right of this 1, bring down 7, the last figure in the dividend, makes 17.

*Fourth.*

I say 17 in 17—once—set one in the quotient, and say once 7 is 7—once 1 is 1 makes 17 to place under 17—subtract, and 0 remains—place your periods under 17, and the lesson is done.

Answer, 2841 cents for each boy, or, \$28.41.

KEY TO CARD No. 23.

LESSON 3.

In 98688 hours how many days?

NOTE.—Twenty-four hours make one day.

24)98688(4112

*First.*

96

—

.26

24

—

.28

24

—

.48

48

—

. .

See how many times 24 are in 96.

In order to guess at the number of

times, find how many times the first

figure in the quotient is contained in

the first figure of the dividend, that

is, how many times 2 in 9? 4 times

—therefore set 4 in the quotient,

and multiply the divisor 24 by 4.

Place the product under 98—sub-

tract—the remainder will be 2—bring

down the next figure of the dividend,

6, to the right side of the 2, makes 26.

*Second..*

How many times 24 in 26? once—set 1 in the quotient, and multiply the divisor 24 by 1—once 4 is 4

—once 2 is 2—place this product under 26—subtract—the remainder is again 2 as before—to the right side of this remainder 2, place the next figure of the dividend, 8, makes 28.

*Third.*

How many times 24 in 28? once—place 1 in the quotient and multiply the divisor again by 1—place the product under 28—subtract—the remainder is 4—to the right side of this remainder 4, set the next and last figure of the dividend, 8—this makes 48.

*Fourth.*

How many times 24 in 48? twice—set 2 in the quotient, and multiply 24 by 2—set the product under 48—subtract—0 remains—place two periods under 48—the task is done. The quotient is the answer, 4112 days.

Here we find that 24 is contained 4112 times in 98688.

## KEY TO CARD No. 23.

## LESSON 4.

*See Card 24, for proof by Multiplication.*

Divide 418392 Dollars between 78 men, what is each man's share?

78)418392(5364

390

—

283

234

—

499

468

—

312

312

—

...

In the first place see how many times 78 in 418—take the first figure of the Divisor and the two first of the Dividend, and see how many times 7 in 41—I can have 5 times 7 in 35—by this I find that 5 may be safely set in the quotient.

Now multiply 78 by 5 and place the product under 418—subtract—the remainder is 28. Bring down the next figure of the dividend, 3—set it on the right side of 28, makes 283.

*Second.*

How many times 78 in 283? In order to guess the number of times, say how many times 7 in 28 times; but as the unit figure in the divisor is a high number, viz. 8, I will make an allowance of 1 and say only 3 times.

Set 3 in the Quotient and multiply the divisor 78 by 3—Place the product under 283—subtract—the remainder is 49—to the right of this remainder set the next figure of the dividend, 9, makes 499.

*Third.*

How many times 78 in 499? how many times 7 in 49 for a guess—7 times; but as the unit figure in the divisor is great, make an allowance of 1 and say 6 times.

Set 6 in the Quotient and multiply the divisor 78 by 6—Set the product under 499—subtract—the remainder is 31; to the right side of this remainder, bring down the next and last figure of the dividend, viz. 2—this makes 312.

How many times 78 in 312? how many 7 in 31—4 times and several over; therefore venture to set 4 in the quotient.

Multiply the divisor 78 by 4—set the product under 312—subtract—the remainder is 0—set three periods under 312 and the lesson is ended.

We find in the quotient 5364, which is the number of dollars for each man or answer.

**NOTE.**—When the remainder is as great, or greater than the divisor, the quotient figure must be augmented.

## KEY TO CARD No. 23.

## LESSON 5.

*See Card 24, for proof, by Multiplication.*

Divide 651744 by 96.

*First,*

96)651744(6789

576

.757

672

.854

768

.864

864

How many times 96 in 651?—how many times 9 in 65—7 times; but make an allowance of 1 and say 6 times—set 6 in the quotient and multiply the divisor 96 by 6.

Set the product under 651—subtract—the remainder is 75—bring down the next figure 7 from the dividend to the right side of 75—this makes 757.

*Second.*

How many times 96 in 757?—to make a guess say how many times 9 in 75?—8 times—make an allowance of 1 and say 7 times—set 7 in the quotient and multiply the divisor 96 by 7.

Set the product under 757—subtract—the remainder is 85—Bring down the next figure 4 from the dividend to the right side of 85—this makes 854.

*Third.*

How many times 96 in 854? to make a guess say how many times 9 in 85—9 times; but allow 1 and say 8 times: set 8 in the quotient and multiply 96 by 8.

Set the product under 854—subtract—the remainder is 86—bring the next and last figure 4 from the dividend, set it on the right of 86, this makes 864.

*Fourth.*

How many times 96 in 864? say 9 times—set 9 in the quotient and multiply the divisor 96 by 9—set the product under 864—subtract—the remainder is nothing—the quotient or answer is 6789.

## KEY TO CARD No. 23.

## LESSON 6.

*See Card, 24, for proof, by Multiplication.*

Divide 977724 by 99.

*First.*

99)977724(9876

891

—

.867

792

—

752

693

—

.594

594

—

...

How many times 99 in 977? to make a guess say how many times 9 in 97—it will be contained 10 times; but allow 1 and say 9 times—set 9 in the quotient and multiply 99 by 9—place the product under 977—subtract—the remainder is 86.—Bring down the next 7 from the dividend to the right side of 86 makes 867.

*Second.*

How many times 99 in 867? to make a guess say how many times 9 in 86—it will be 9 times; but make an allowance of 1 and say 8 times—set 8 in the quotient and multiply 99 by 8.

Place the product under 867—subtract—the remainder is 75—bring down the next figure 2 from the dividend to the right side of 75 makes 752.

*Third.*

How many times 99 in 752? seek how many times 9 in 75—it is contained 8 times; but allow 1 and say 7 times.

Multiply 99 by 7—place the product under 752—subtract—the remainder is 59—bring down the next and last figure 4 from the dividend to the right side of 59—this makes 594.

*Fourth.*

How many times 99 in 594? seek how many times 9 in 59—6 times 9 are 54—set 6 in the quotient and multiply 99 by 6.—Place the product under 594—subtract—the remainder is nothing—place three periods under 594.

*The quotient or answer is 9876.*

## KEY TO CARD No 23.

## LESSON 7.

*See Card 24, for proof by Multiplication.*

Divide 34615 by 182.

182)34615(190

182

1641

1638

...35

*First.*

How many times 182 in 346? seek how many times 18 in 34—one—set 1 in the quotient—multiply 182 by 1—place the product under 346—subtract—the remainder is 164,

Bring the next figure 1 from the dividend to the right side of 164, makes 1641.

*Second.*

How many times 182 in 1641? look at the Table under 18, and see how many times 18 in 164—the last number under 18 is the place to begin to count upwards—the first number less than 164 is the guide to guess by, that is, 162—opposite 162 stands 9 times—then place 9 in the quotient.

Multiply the divisor 182 by 9—place the product under 1641—subtract—the remainder is 3—bring down 5, the last figure in the dividend to the right side of 3, makes 35.

*Third.*

How many times 182 in 35—no times—set 0 in the quotient—call this 35 a remainder, a number undivided.

The quotient or answer is  $190\frac{35}{182}$ \*

\*If the dividend had been dollars, this remainder 35, should be reduced to cents and divided by 182. If the dividend had been pounds Avoirdupois, the pounds must have been reduced to ounces, &c. then divided by 182.

## KEY TO CARD No. 23.

## LESSON 8.

*See Card 24 for proof by Multiplication.*

Divide 64329 by 194.

194)64429(331

582

—

. 612

582

—

. 309

194

—

115

*First.*

How many times 194 in 643? To make a guess, say how many times 19 in 64? Look at the Table—begin at the last number under 19 and count upwards till you come to a number less than 64, say 57—opposite this stands 3—set 3 in the quotient and multiply the divisor 194 by 3.

Place the product under 643—subtract—the remainder is 61—bring down the next figure 2 from the dividend to the right side of 61 makes 612.

*Second.*

How many times 194 in 612? To make a guess, seek how many times 19 in 61—look at the Table—begin at the last number under 19, count up till you find a number less than 61—say 57 as before; opposite 57 stands 3—set 3 in the quotient.

Multiply the divisor 194 by 3—place the product under 612—subtract—the remainder is 30—bring down the next figure 9 from the dividend to the right side of 30, makes 309.

*Third.*

How many times 94 in 309? To make a guess, say how many times 19 in 30—We readily know but one—set 1 in the quotient, and set once 194 under 309—subtract—the remainder is 115.

The quotient or answer is  $331\frac{1}{2}$ .

## KEY TO CARD No. 23.

## LESSON 9.

*See Card 24 for proof by Multiplication.*

Divide 684,927 by 4300.

*Directions.*

Cut off the two ciphers from the divisor and divide by 43.

Cut off as many figures from the right of the dividend, viz. 27.

Your dividend will then be 6849 to be divided by 43.

## EXAMPLE.

43|00)6849|27(159

43

—  
254

215

—  
. 399

387

—  
. 1227

The 27 cut off is a part of the remainder and must be placed on the right of 12, makes a remainder of 1227.

*First.*

How many times 43 in 68?—We know by reflecting a moment that it can be contained only once.

Set 1 in the quotient and place once 43 or one time 43 under 68—subtract—the remainder is 25—bring down the next figure 4 from the dividend, makes 254.

*Second.*

How many times 43 in 254?—To make a guess, seek how many times 4 in 25—though it is contained 6 times, allow 1 and say 5 times—set 5 in the quotient.

Multiply 43 by 5—place the product under 254—subtract—the remainder is 39—bring down the next figure 9 from the dividend to the right side of 39, makes 399.



*Third.*

How many times 43 in 399?—To make a guess, seek how many times 4 in 39—we know that 9 times 4 are contained in 36 and can venture to place 9 in the quotient.

Multiply 43 by 9—place the product under 399—subtract—the remainder is 12; and to this remainder must be annexed 27, the two figures cut off the dividend—this number 27 being annexed, will make a remainder of 1227.

The quotient or answer is 159 $\frac{11}{13}$ .

## KEY TO CARD No. 24.

## LESSON 10.

Divide 1,288,241 by 5600.

*Directions.*

Cut off the two ciphers in the divisor, and as many figures in the dividend, then divide by 56.

## EXAMPLE.

56|00)12882|41(230|

112

. 168

168

...241

*First.*

How many times 56 in 128? to make a guess, seek how many times 5 in 12—we know it will be twice.

Set 2 in the quotient and multiply 56 by 2—place the product under 128—subtract—the remainder is 16—bring down the next figure 8 from the dividend to the right side of 16, makes 168.

*Second.*

How many times 56 in 168?—Say how many times 5 in 16—we easily perceive it is contained 3 times—set 3 in the quotient.

Multiply 56 by 3—set the product under 168—subtract—nothing remains—bring down the 2.

*Third.*

How many times 56 in 2?—we cannot have 56 in 2, therefore set 0 in the quotient.

Now the 2 is a part of the remainder—bring the 41, which was cut off the dividend, to the right side of 2, and it makes a remainder of 241. The quotient or answer is  $230\frac{241}{5600}$ .

## KEY TO CARD No. 24.

## LESSON 11.

Divide 8,123,187 by 346.

346)8123187(23477

692

—

1203

1038

—

.1651

1384

—

.2678

2422

—

.2567

2422

—

Rem. .145

Set 3 in the quotient and multiply 346 by 3—place the product under 1203—subtract—the remainder is 165—bring down the next figure 1 from the dividend to the right side of 165, makes 1651.

*Third.*

How many times 346 in 1651?—Seek how many times 3 in 16—it is 5 times—but allow 1 and say 4 times.

Set 4 in the quotient and multiply 346 by 4—place the product under 1651—subtract—the remainder is

M\*

267—bring down the next figure 8 from the dividend makes 2678.

*Fourth.*

How many times 346 in 2678?—Seek how many times 3 in 26—though 8 times, yet allow one and say 7 times.

Set 7 in the quotient and multiply 346 by 7—place the product under 2678—subtract—the remainder is 256—bring down the next and last figure 7 from the dividend, makes 2567.

*Fifth.*

How many times 346 in 2567? seek how many times 3 in 25—8 times but allow one and say 7 times.

Set 7 in the quotient and multiply 346 by 7—place the product under 2567—subtract—the remainder is 145.

The quotient or answer is 23477 $\frac{145}{346}$ .

KEY TO CARD No. 24.

LESSON 12.

Divide 123,456,789 by 123.

123)123456789(1003713

123

... 456

369

.877

861

.168

123

.459

369

.90

*First.*

How many times 123 in 123? we readily say one—set 1 in the quotient.

Multiply 123 by 1—the product is 123—place this product under the number 123 in the dividend—subtract—there remains 0—bring down the next figure 4 from the dividend.

*Second.*

How many times 123 in 4?—not one; set 0 in the quotient—bring down the next figure 5; it makes 45.

*Third.*

How many times 123 in 45?—not one; set 0 in the quotient—bring down the next figure 6; it makes 456.

*Fourth.*

How many times 123 in 456? 3 times—set 3 in the quotient—Multiply the divisor 123 by 3—place the product under 456—subtract—the remainder is 87—bring down the next figure 7; it makes 877.

*Fifth.*

How many times 123 in 877? To make a guess, say 12 in 87—7 times—place 7 in the quotient.—Multiply the divisor 123 by 7—place the product under 877—subtract—the remainder is 16—bring down the next figure 8; it makes 168.

*Sixth.*

How many times 123 in 168? one—set 1 in the quotient. Multiply and subtract—the remainder is 45—bring down 9 the last figure in the dividend; it makes 459.

*Seventh.*

How many times 123 in 459? seek how many times 12 in 45—3 times—set 3 in the quotient.—Multiply the divisor 123 by 3—place the product under 459—subtract—the remainder is 90.

The quotient or answer is  $1,003,713\frac{90}{123}$  which number in words, will read thus, One million three thousand seven hundred and thirteen, and ninety, one hundred and twenty-threes.

**NOTE.**—The three following questions may be wrought by Short Division, if you cut off the cipher in the divisor, and the right hand figure in the dividend.

Although this mode of cutting off ciphers, will sometimes expedite business; yet it is not advisable except when the calculator understands his *problem*, and is master of the subject then under consideration.

## KEY TO CARD No. 24.

## LESSON 13.

In 78,433 shillings, how many pounds?

Answer,  $2|0)7843|3$       Here cut off the 0 in the right hand 3 in the dividend, then divide 7843 by 2.

How many times 2 in 7? 3 times and 1 over; 3 under the 7. One over carry to the left side of makes 18—2 in 18—9 times; set 9 under 8—2 in—twice; set 2 under the 4. Then 2 in 3—once and 1 over—set 1 under the 3 and carry the 1 over to the left side of the 3 cut off, which will make 13 shilling for a remainder.

This gives a quotient number, Three thousand nine hundred and twenty-one pounds thirteen shillings, for an answer, or thus,  $3921\frac{13}{20}$ .

*Explanation of cutting off ciphers.*

† In the first place we will suppose that 10 apples are to be divided between 10 boys: the common manner of operating will be to place the work thus,  $10)10(1$ . Here we say how many times ten in ten? One. Set down 10, and cut off the place of units, which in this case is a nought, and the 1 on the left, will be the quotient or answer, thus,  $1|0$ .

In the next place, suppose 400 dollars are to be divided between 100 men:— $100)400(4$ . We say how many times 100 in 400? 4 times. Now set down 100 for a divisor, and 400 for a dividend, cut off the ciphers in the divisor, and as many in the dividend, then divide 4 by 1, the quotient will be 4 for an answer, thus  $1|00\ 4|00$ .

4

one in 4? 4 times.

† In all similar cases it may be observed, that, if we cut off units, tens, hundreds, thousands or more, in the divisor we may also cut off as many places in the dividend; this will keep the work in the like pro-

portion as at first. And if there be figures different from ciphers, cut off the dividend, annex them to the right of the remainder.

† Again : Suppose 4576 dollars are to be divided between 200 men : By short division the work will stand thus,  $2|00)45|76$

Quotient, 22 176 remainder. Here the 1 remaining after dividing the 5, is placed on the left of 76 which was cut off the dividend.

*Operation by Long Division.*

$200)4576(22$  Quotient or answer,  
400

—  
.576

400

—  
176 Remainder.

KEY TO CARD No. 24.

### LESSON 14.

If 40 rods make 1 furlong, I wish to know how many furlongs are in 98643 rods?

$4|0)9864|3$

Answer, 2466 fur. 3 rods.

How many times 4 in 9? twice, and 1 over; set down 2 under 9 and carry 1 to the left side of 8 makes 18—How many times four in 18? 4 times and 2 over; set 4 under 8 and carry 2 to 6 makes 26—How many times 4 in 26? 6 times and 2 over; set 6 under 6, and carry 2 to 4 makes 24—How many times 4 in 24? 6 times; set 6 under 4.

The quotient is 2466, and the figure cut off the dividend, is  $\frac{3}{40}$  of a furlong, or 3 rods remaining.

KEY TO CARD No. 24.

### LESSON 15.

Sixty seconds make 1 minute. How many minutes in 39645 seconds?

$$6 \overline{)0}3964 \overline{)5}$$

Answer, 660 m. 45 sec.

How many times 6 in 39?—6 times and 3 over—6 in 36? 6 times—6 in 4? 0, but 4 remains to be placed on the left side of the 5 cut off—this makes 45 seconds for a remainder, or  $\frac{45}{60}$  of a minute.

The Quotient is 660 and 45 the Remainder.

NOTE.—When the remainder is less than the Divisor, it is a sign that the work is correct; but if the Remainder happen greater than the Divisor, the work is wrong.

Let us prove a few Lessons in Long Division, ~~by~~ Multiplication.

### RULE.

Multiply the Divisor and quotient together, the Product will be like unto the Dividend.

If there be a Remainder, add it to the Product.

### KEY TO CARD No. 24.

For *examples* take the six following Lessons on Card No. 23, and 24.

#### LESSON 4.

The Quotient is, 5 3 6 4  
The Divisor, 7 8

$$\begin{array}{r} 4 \ 2 \ 9 \ 1 \ 1 \\ 3 \ 7 \ 5 \ 4 \ 8 \\ \hline \end{array}$$

Proof, 4 1 8 3 9 2

#### LESSON 5.

The Quotient is, 6 7 8 9  
The Divisor, 7 8

$$\begin{array}{r} 4 \ 0 \ 7 \ 3 \ 4 \\ 6 \ 1 \ 1 \ 0 \ 1 \\ \hline \end{array}$$

Proof, 6 5 1 7 4 4

#### LESSON 6.

The Quotient is, 9 8 7 6  
The Divisor, 9 9

$$\begin{array}{r} 8 \ 8 \ 8 \ 8 \ 4 \\ 8 \ 8 \ 8 \ 8 \ 4 \\ \hline \end{array}$$

Proof, 9 7 7 7 2 4

#### LESSON 7.

The Divisor is, 1 8 2  
The Quotient, 1 9 0

$$\begin{array}{r} 1 \ 6 \ 3 \ 8 \ 0 \\ 1 \ 8 \ 2 \\ \hline \end{array}$$

Remainder, 3 5

Proof, 3 4 6 1 5

In this Lesson 7th, take the Divisor for a Multiplier, because the Quotient 190 has a cipher at the right; which cipher may be omitted in Multiplication, and only annexed in the place of units, in the product.

LESSON 8.

The Divisor is, 1 9 4  
 The Quotient, 3 3 1  


---

 1 9 4  
 5 8 2  
 5 8 2  
 Remainder 1 1 5  


---

 Proof, 6 4 3 2 9

LESSON 9.

The Quotient is 1 5 9  
 The Divisor, 4 3 0 0  


---

 4 7 7 0 0  
 6 3 6  
 Remainder, 1 2 2 7  


---

 Proof, 6 8 4 9 2 7

The ciphers are to be omitted in Multiplication, and added in the place of units and tens, in the products.

END OF PART FIFTH.



# INTRODUCTION TO ARITHMETIC.

## PART VI.

CONTAINING

COMPOUND DIVISION, ARITHMETICAL  
CHARACTERS, AND DECIMALS.



### COMPOUND DIVISION.

KEY TO CARD No. 25.

#### LESSON 1.

Divide £784 16s. 4d. between four men.

£.	s.	d.		<i>Pounds.</i>
4)784	16	4		Four in 7—1 and 3 over—4 in
196	4	1		38—9 and 2 over—4 in 24—6 times <del>6</del> <i>6</i>

*Shillings.*

Four in 16—4 times.

*Pence.*

Four in 4—1.

Quotient in words, One hundred and ninety-~~4~~ *6* six pounds four shillings and one penny. This is each man's part.

KEY TO CARD No. 25.

#### LESSON 2.

Divide £1454 19s. between 8 men.

£.	s.	d.	q.		<i>Pounds.</i>
8)1454	19	0	0		How many times 8 in 14? <i>1</i>
181	17	4	2		and 6 over—How many times <i>6</i>
in 65?	8	and 1 over—			How many times 8 in 14? <i>1</i>

and 6 over to carry to the shillings.

*Shillings.*

Six pounds over make 120s. and 19 make 139—  
How many times 8 in 139? 17 and 3 over I carry  
to the pence.\*

*Pence.*

Three shillings over I carried make 36 pence—  
How many times 8 in 36? 4 times and 4 over I carry  
to the farthings.

*Farthings.*

Four pence over I carried make 16 farthings—How  
many times 8 in 16? 2.

Answer, £181 17 4 2.

## KEY TO CARD No. 25.

## LESSON 3.

Divide £1173 12s. 9d. by 12.

£.	s.	d.	q.		<i>Pounds.</i>
12)	1173	12	9	0	How many times 12 in 117?
	97	16	0	3	9 and 9 over—How many times
					12 in 93? 7 and 9 over I carry to the shillings.

*Shillings.*

Nine pounds over I carried make 180s. and 12  
make 192. How many times 12 in 192? 16.

*Pence.*

Twelve in 9—0—carry 9 to the farthings.

*Farthings.*

Nine pence I carried make 36 farthings—How  
many times 12 in 36? 3.

Answer, £97 16 0 3.

## KEY TO CARD No. 25.

## LESSON 4.

If 19 yards of broadcloth cost £35 12 6, what is  
that a yard?

\* Set 139 shillings on some part of your slate for a memorandum  
and divide by 8, as in Short Division. Set the quotient 17 in the  
place of shillings, and carry the 3 over to the pence.

£. s. d.  
19)26 12 6(13)

19

—  
16

20

19)332(17s.

19

—  
142

133

—  
.. 9

12

19)114(6d.

114

—  
...

Ans. £1 17 6

### Directions for the calculation of Lesson 4.

Place the £35 12s. 6d. on your slates as you see it on the Card with 19 before it for a divisor—Then seek how many times 19 in 35—say 1; set 1 off at the right hand for a quotient; this is 1 pound, because you can have once 19 in 35.

Now multiply 19 the divisor, by 1 and place the product under 35—subtract—the remainder is 16—This is 16 pounds to be multiplied by 20 to bring it into shillings, and the 12s. must be added in the product, which will make 332s.

Thus, 0 times 6 is 0, but 2 in the 12s. makes 2; set 2 in the place of units.

Then, twice 6 are 12, and 1 in the 12s. above makes 13; set 3 in the place of tens—carry 1.

Then, twice 1 makes 2 and 1 I carried makes 3; set another 3 in the place of hundreds. Thus you have for a product, 392s., or in this case a *dividend*.

How many times 19 in 332? First seek how many times 19 in 33? say 1—place 1 off at the right for a quotient—multiply 19 by 1—place the product under 33—subtract—the remainder is 14.

Bring down the 2 to the right side of 14, makes 142—seek how many times 19 in 142—7 times—place 7 on the right of 1 in the quotient. This makes 17s.

Now multiply 19 by 7—place the product under 142—subtract—the remainder is 9s. to be reduced to pence

Multiply 9 by 12, the number of pence in a shil-

ing, and bring in the 6d. of the given sum above, makes 114 pence.

Again; how many times 19 in 114? 6 times—place 6 off at the right for a quotient—this is 6 pence—Multiply 19 by 6—place the product under 114—subtract, and nothing remains.

### Recapitulation..

In the first quotient you had 1 pound; in the second 17 shillings, and in the third 6 pence.

These make for an answer, £1 17 6.

### KEY TO CARD No. 25.

#### LESSON 5.

If 23 barrels of pork cost £179 17 7, what is that a barrel?

£.	s.	d.
23)179	17	7(7£
161		
—		
.18		
20		
—		
23)377	(16s.	
23		
—		
147		
138		
—		
..9		
.12		
—		
23)115	(5d.	
115		
—		
...		

#### Pounds.

How many times 23 in 179? 7 times—place 7 in the quotient for pounds.

Multiply 23 by 7—place the product under 179—subtract—the remainder is 18 pounds to be reduced to shillings, to which add the 17s. in the given sum, as in lesson 4. This reduction will make 377s.

How many times 23 in 377? seek first how many times 23 in 37—1; set 1 in the quotient.

Multiply 23 by 1—place the product under 37—subtract—the remainder is 14—bring down the 7 makes 147.

How many times 23 in 147? 6 times—place 6 in the quotient—this makes 16s.

Multiply 23 by 6—place the quotient under 147—subtract—the remainder is 9s. to be reduced to pence; multiply 9 by 12, the number of pence in a shilling, and add to the product the 7 pence in the given sum above; this operation makes 115 pence.

Now, how many times 23 in 115? 5 times—place 5 in the quotient; this makes 5 pence. Multiply 23 by 5—place the product under 115—subtract—the remainder is 0.

### *Recapitulation.*

Your first quotient was £7; the second 16s. and the third 5d.—making in the whole, for an answer, £7 16 5.

## KEY TO CARD No. 25.

### LESSON 6.

Bought 26 watches for £239 4 0, what did each one cost?

£.	s.	d.
26)239	4	0(9£
234		
—		
..5		
20		
—		
26)104(4s.		
104		

### *Pounds.*

How many times 26 in 239? 9 times—set 9 in the quotient for pounds; multiply 26 by 9—place the product under 239—subtract—the remainder is £5 to be multiplied by 20 to reduce it into shillings, and at the same time add in the 4 shillings in the given sum, which makes 104s.

### *Shillings.*

How many times 26 in 104?—4 times—place 4 in the quotient for shillings and multiply 26 by 4—place the product under 104—subtract—nothing remains.

Thus you have in the first quotient £9, and in the second 4s.; making for an answer £9 4s. the price of each watch.

KEY TO CARD No. 25.

LESSON 7.

Divide £486 15s. between 33 men, what is each man's part.

£. s.	Pounds.
33)486 15(14£	How many times 33 in 48?—1 ;
33	set 1 in the quotient—multiply 33 by
—	1—place the product under 48—sub-
156	tract—the remainder is 15 ; bring
132	down the 6 makes 156.
—	How many times 33 in 156?—4
.24	times—set 4 in the quotient makes
20	14 pounds—multiply 33 by 4—place
—	the product under 156—subtract—
33)495(15s.	the remainder is £24 to be reduced
33	into shillings and added to the 15s.
—	in the given sum, which makes 495s.
165	How many times 33 in 49?—1—
165	place 1 in the quotient for shillings
—	—multiply 33 by 1—place the pro-
...	duct under 49—subtract—the re-

mainder is 16—bring down the 5 makes 165.

How many times 33 in 165?—5 times—place 5 in the quotient which makes 15 for shillings—multiply 33 by 5—place the product under 165—subtract—the remainder is nothing.

*Recapitulation.*

The first quotient was £14, the second is 15s. which make for an answer £14 15s.

KEY TO CARD No. 25.

LESSON 8.

A number of benevolent gentlemen, visiting the school, say to the teacher, "Here is a sum of £566 7s. to be divided between 47 of your best boys for the procurement of books : " what sum will each boy have ?

*Recapitulation.*

The first quotient is 1 shilling and the second is 9 pence ; which makes the answer £0 1s. 9d. for the price of each pound.

See remarks after Lesson 12.

## KEY TO CARD No. 25.

## LESSON 11.

Bought  $56\frac{1}{2}$  yards of calico for £9 8 4, what is that a yard?

In this case  $56\frac{1}{2}$  is the quantity.  
Multiplied by 4 for a divisor.

The divisor is 226 quarters of yards.  
The price is £9 8 4  
Multiplied by 4 for a dividend.

The dividend is £37 13 4 a quadruple sum from the first.

Proceed and divide this sum by 226. The quotient will be the answer.

£.	s.	d.
226)37	13	4
20		
<hr/>		
226)753	(3s.	
678		
<hr/>		
75s.	4d.	
12		
<hr/>		
226)904	(4d.	
904		
<hr/>		
...		

In this Lesson I find that 226 cannot be contained in £37, therefore reduce the pounds to shillings and bring in the 13 shillings, which make 753s.

Divide this sum by 226—the quotient is 3s. and there remain 75s. and 4d. over, to be reduced into pence, which makes 904d.—Divide this by 226—the quotient is 4d.

*Recapitulation.*

The first quotient is 3s.—the second, 4d. consequently the answer is £0 3 4.

KEY TO CARD No. 25.

LESSON 12.

If  $77\frac{1}{4}$  bushels of salt cost £34 0 3 3, what is that a bushel?

The quantity is  $77\frac{1}{4}$  bushels.  
Multiplied by 4

The divisor is 311 quarters of bushels.

The price is £34 0 3 3  
Multiplied by 4

The dividend is £136 1 3 0 a quadruple sum from the first price.

Now proceed and divide this sum by 311, the quadruple sum of the quantity; the quotient will be the answer.

<p>£. s. d.</p> <p>311)136 1 3</p> <p style="padding-left: 20px;">20</p> <hr style="width: 50px; margin-left: 0;"/> <p>311)2721(8s.</p> <p style="padding-left: 20px;">2488</p> <hr style="width: 50px; margin-left: 0;"/> <p style="padding-left: 20px;">.233</p> <p style="padding-left: 40px;">12</p> <hr style="width: 50px; margin-left: 0;"/> <p>311)2799(9d.</p> <p style="padding-left: 20px;">2799</p>	<p>Three hundred and eleven cannot be contained in 136, therefore reduce the pounds, 136 into shillings, and add the 1 shilling above, which makes 2721s.</p> <p>Divide this sum by 311, the quotient is 8s. and the remainder 233s.</p> <p>Reduce this remainder into pence, and add the 3d. above, which makes 2799d. Divide this number by 311—The quotient is 9d.</p>
---	---

The answer to the question is £0 8s. 9d.

Remarks.

NOTE 1. When multiplying the  $34\frac{1}{4}$  pounds by 4, in Lesson 10, I say 4 times 4 are 16 and the one fourth makes 17—7 and carry 1—then 4 times 3 are 12 and 1 is 13, which makes 137 for a divisor. This augments the quantity, and makes it 4 times greater than at first.



2. Then I multiply the price £2 19 11 1 by 4, as in Compound Multiplication, which multiplying makes a sum of £11 19 9. This also augments the *price*, and makes it 4 times greater than at first, or a quadruple sum from the first.

3. In multiplying  $56\frac{1}{2}$  by 4 in Lesson 11, I say, 4 times 6 are 24 and the two fourths in the fraction make 26—6 and carry 2, &c.

4. When multiplying  $77\frac{3}{4}$  of Lesson 12, I say, 4 times 7 are 28, and the three fourths in the fraction make 31—1 and carry 3, &c.

5. Multiplying the *quantity* by 4, and multiplying the *price* by 4, keep the numbers in proportion; as in the following example.

Suppose we divide 6 by 2, the quotient is 3.

Now multiply the divisor 2, by 4, it makes 8; and multiply the dividend 6, by 4, it makes 24.

Divide 24 by 8, the quotient is 3, the same as when dividing 6 by 2.

*How to find the price of one pound, when the price is given of one hundred weight or 112 pounds.*

#### RULE.

Divide the price of 112 pounds by 8—divide that quotient by 7, which makes a second quotient; then divide this second quotient by 2, and the third quotient will be the answer.

#### EXAMPLES.

KEY TO CARD No. 25.

#### LESSON 13.

If one hundred of iron cost 79s. 4d. what is that a pound?

NOTE.—It will make no difference to divide by 7 first and then by 8.

s.	d.	q.	First.	Shillings.
7)79	4		Seven	in 7—1—7 in 9—1 and 2 remain I carry to the pence.
8)11	4			
2) 1	5			
	8	2		

*Pence.*

Two shillings I carried make 24 pence and 4 are 28—7 in 28—4.

*Second. Shillings.*

Eight in 11—1 and 3 over I carry to the pence,

*Pence.*

Three shillings over I carried make 36 pence and 4 make 40—How many times 8 in 40?—5.

*Third. Shillings.*

Two in one I cannot; but 1s. makes 12 pence and 5 are 17—two in 17—8 times and 1 over—1 penny makes 4 farthings—2 in 4—2 times.

Thus we find the answer to be 8d. 2q.

KEY TO CARD NO. 25.

LESSON 14.

A merchant bought 5 hundred weight of lead for £14 11 8, what was that a pound?

£.	s.	d.	q.	<i>First. Pounds.</i>
5)14	11	8		Five in 14—2, and £4 over.
8) 2	18	4		<i>Shillings.</i>
7)	7	3	2	£4 over make 80s. and 11 are 91.
2)	1	0	2	Five in 91—18 times and 1 over.
		6	1	

*Pence.*

One shilling over makes 12 pence and 8 are 20—5 in 20—4 times.

£2 18s. 4d. is the price of 112 pounds.

*Second. Pounds.*

Eight in 2—no times, but 2 pounds make 40s. and 18s make 58s.

*Shillings.*

Eight in 58—7 times and 2 over.

*Pence.*

Two shillings over make 24 pence and 4 are 28—8 in 28—3 times and 4 over.

2. Then I multiply the price £2 19 11 1 by 4, as in Compound Multiplication, which multiplying makes a sum of £11 19 9. This also augments the *price*, and makes it 4 times greater than at first, or a quadruple sum from the first.

3. In multiplying  $56\frac{1}{4}$  by 4 in Lesson 11, I say, 4 times 6 are 24 and the two fourths in the fraction make 26—6 and carry 2, &c.

4. When multiplying  $77\frac{3}{4}$  of Lesson 12, I say, 4 times 7 are 28, and the three fourths in the fraction make 31—1 and carry 3, &c.

5. Multiplying the *quantity* by 4, and multiplying the *price* by 4, keep the numbers in proportion; as in the following example.

Suppose we divide 6 by 2, the quotient is 3.

Now multiply the divisor 2, by 4, it makes 8; and multiply the dividend 6, by 4, it makes 24.

Divide 24 by 8, the quotient is 3, the same as when dividing 6 by 2.

*How to find the price of one pound, when the price is given of one hundred weight or 112 pounds.*

#### RULE.

Divide the price of 112 pounds by 8—divide that quotient by 7, which makes a second quotient; then divide this second quotient by 2, and the third quotient will be the answer.

#### EXAMPLES.

#### KEY TO CARD No. 25.

#### LESSON 13.

If one hundred of iron cost 79s. 4d. what is that a pound?

**NOTE.**—It will make no difference to divide by 7 first and then by 8.

s.	d.	q.		<i>First. Shillings.</i>
7)79	4			Seven in 7—1—7 in 9—1 and 2 re-
8)11	4			main I carry to the pence.
2) 1	5			
	8	2		

*Pence.*

Two shillings I carried make 24 pence and 4 are 28—7 in 28—4.

*Second. Shillings.*

Eight in 11—1 and 3 over I carry to the pence,

*Pence.*

Three shillings over I carried make 36 pence and 4 make 40—How many times 8 in 40?—5.

*Third. Shillings.*

Two in one I cannot; but 1s. makes 12 pence and 5 are 17—two in 17—8 times and 1 over—1 penny makes 4 farthings—2 in 4—2 times.

Thus we find the answer to be 8d. 2q.

KEY TO CARD NO. 25.

LESSON 14.

A merchant bought 5 hundred weight of lead for £14 11 8, what was that a pound?

£.	s.	d.	q.	<i>First. Pounds.</i>
5)14	11	8		Five in 14—2, and £4 over.
8) 2	18	4		<i>Shillings.</i>
7)	7	3	2	£4 over make 80s. and 11 are 91.
2)	1	0	2	Five in 91—18 times and 1 over.
		6	1	

*Pence.*

One shilling over makes 12 pence and 8 are 20—5 in 20—4 times.

£2 18s. 4d. is the price of 112 pounds.

*Second. Pounds.*

Eight in 2—no times, but 2 pounds make 40s. and 18s make 58s.

*Shillings.*

Eight in 58—7 times and 2 over.

*Pence.*

Two shillings over make 24 pence and 4 are 28—8 in 28—3 times and 4 over.

*Farthings.*

Four pence over make 16 farthings—8 in 16—2 times.

*Third. Shillings.*

Seven in 7—1.

*Pence.*

Seven in 3—0, but 3*d.* remain undivided.

*Farthings.*

Three pence remaining undivided, make 12 farthings and 2 are 14—7 in 14 twice.

*Fourth. Shillings and Pence.*

Two in 1—0, but 1*s.* makes 12*d.*—2 in 12—6 times; set 6 for pence.

*Farthings.*

Two in 2 farthings—1; set 1 for farthings.—The answer is 6*d.* 1*q.* a pound.

Compound Division is proved by Compound Multiplication.

**EXAMPLE.**

Reverse the last lesson or quotient and say, "If 1 pound of lead cost 6*d.* 1*q.*, what will five hundred weight cost?"

£.	s.	d.	q.
		6	1
			2
<hr/>			
	1	0	2
			7
<hr/>			
	7	3	2

£.	s.	d.	q.
	7	3	2
			8
<hr/>			
	2	18	4
			0
			5
<hr/>			
£14	11	8	0

cwt.

5

Proof.

**QUESTIONS APPLIED IN DIVISION.****†LESSON 15.**

If 17 bushels of wheat cost \$35.06, what is that by the bushel? Answer, \$2.06. See Lesson 4.

## † LESSON 16.

Sold 30 yards of cambrick for \$22.50; how much was that a yard? Answer, 75 cents.

## † LESSON 17.

If a man has \$14.56 for 26 days, how much is that by the day? Answer, 56 cents.

## † LESSON 18.

If 18 bushels of salt cost \$15.75, what will 1 bushel cost? Answer, 87.5 cents.

## † LESSON 19.

When 230 gallons of wine cost \$690, what was that a gallon? Answer, \$3.

## † LESSON 20.

Forty-eight yards of cloth cost £37; the price of one yard is required? Answer, £0 15s. 5d.

## † LESSON 21.

Two bags of sugar, each weighing 56 pound, cost \$14; how much was that a pound? Answer, 12.5

## † LESSON 22.

If 230 bushels of barley cost £80 10s. what is that a bushel? Answer, 7s.

## † LESSON 23.

Eighty pounds of Indigo cost £66; what is that a pound? Answer, 16s. 6d.

## † LESSON 24.

If a public building cost \$7565.04, and the expense be divided equally between 553 persons, what will each one pay? Answer, \$13.68.

## † LESSON 25.

Bought six pieces of cloth, each containing 25 yards, for £92 10s.; what was that a yard? Answer, 12s. 4d.

## † LESSON 26.

Four hundred pounds of sugar cost \$50; what is that a pound? Answer, 12.5 cents.

## † LESSON 27.

If a man have \$1100 for a year's service, how much is that a day, allowing 365 days to the year, and 78 days off for Sundays and lost time?

Answer, \$3.832†~~11~~.

## † LESSON 28.

Suppose a man have an estate of \$3459, and should leave  $\frac{1}{4}$  of it to Harry,  $\frac{1}{4}$  to Susan, and the residue to Charlotte; what will be each one's share?

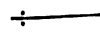



Answer, { Harry's \$864.75.  
Susan's 576.50.  
Charlotte's 2017.75.

## LESSON 29.


What is the half, and third, of 7608, and what is the remainder?


Answer, { 3804 Half.  
2536 Third.  
1268 Remainder.



## FORM OF ARITHMETICAL CHARACTERS.


Equal to, marked thus, =		Division, marked thus, ÷	
Addition, - - - - +		Proportion, : : :	
Subtraction, - - - - -		Square, - - - -	
Multiplication, - - - - X		Square Root, - -	


## EXPLANATION.

= Two parallel lines denote *Equality*; as, 3s.=36 pence ; that is, three shillings equal thirty-six pence.

+ A perpendicular and horizontal line forming a cross, signify *Addition*; as, 4+2=6. 3+2+4=9. Read thus  4 more 2 equal 6. 3 more 2 more 4 equal 9.

- A single dash denotes *Subtraction*; as, 7-2=5.  7  
-2-1=4. Read, 7 less 2 equal 5. 7 less 2 less  1  
equal 4.

X Two lines forming a cross diagonally, signify *Multiplication*; as, 4X2=8. That is, 4 multiplied by  2  
equals 8.

÷ A dash with two periods, one above and one below the centre, signify *Division*; as, 12÷2=6, That is,  2

\*In this book, the dash is not used arithmetically till after *Division*.

divided by 2 equals 6. An inverted *perenthesis* also denotes division.

∴ : Four points set in the middle of four numbers, denote the numbers to be *proportional* to one another, in the *Rule of Three*; as  $3 : 6 :: 12 : 24$ . That is, as 3 are : to 6 :: so are 12 : to 24.

— | A square signifies that the square of any number is required; as,  $\square 4 = 16$ ; or the square of 4 equals 16.  
 ✓ This reversed figure seven signifies that the Square Root of a number is required, as,  $\sqrt{16} = 4$ ; that is to say, the Square Root of 16 equals 4. or is 4.

These characters are used to save written words, and to show when to add, subtract, multiply or divide, without a tedious series of writing. The learners may copy them several times on their slates. See Card No. 26.

## DECIMALS.

Having given a hint of *decimals* in multiplication, I will now insert a few lessons to aid the learner in common business; but as the whole subject of fractions is tedious and but little in use, shall give a view of the most necessary cases only.

What is a fraction?

It is some part of an integer; that is, some part of a whole number; as,  
 One fourth. One half. Three fourths. Seven eighths.

$\frac{1}{4}$                        $\frac{1}{2}$                        $\frac{3}{4}$                        $\frac{7}{8}$   
 Nineteen twentieths, &c.  $\frac{19}{20}$ .

These are called vulgar fractions; and for ease, plainness, and despatch of business, decimals have been invented for a *substitute*. Therefore our first business will be to form fractions into decimals.

In order to understand ourselves, let us have a name for each part of the foregoing fractions.

The upper number is called *Numerator*; and is made by a remainder after division.

The lower number is called *Denominator*; and is the divisor in Division. Thus, divide 17 cents equal-



ly between 4 boys, each share is  $4\frac{1}{4}$ ; that is, four and one fourth.

To turn fractions into decimals, observe the following

### RULES.

1. Annex, that is, place on the right side of the *Numerator*, one or more ciphers, and call it a *Dividend*.

2. Take the lower number, the *Denominator*, for a divisor: The quotient will be the decimal required.

### KEY TO CARD No. 26.

#### CASE 1.

#### LESSON 1.

What is the decimal of  $\frac{1}{4}$ ?

4)1.00(.25

The numerator is 1.

8

The denominator 4.

—

Answer, .25 hundredths.

20

*Remarks.*

20

In decimal operations, Long Division is preferable to Short Division, on account of knowing where to place the dividing point. This point is the only difficulty to be met with in decimals. It is a period called the *separatrix*, to separate decimals from integers, and integers from decimals.\*

When we shall readily know where to place this point, decimals will become as familiar as integers; and greatly expedite business in frequent instances.

To know how, and where to place this point, let us attend to a few particular rules.

### DIVISION.

1. Count the decimal places in the dividend. Suppose them to be two as in lesson first.

2. Count the number of decimals in the divisor, if any, then begin at the right hand figure in the quo-

\*Integer signifies a whole number; as, a pound, an ounce, a bushel, gallon, &c. "The whole of any thing."

tient, and continue counting towards the left, till you have a number equal to the decimals in the dividend: there place the separatrix or point.

3. But if the number of figures in the quotient fall short, then prefix ciphers on the left till your counting is completed: there place the point.

4. When the dividend is less than the divisor, annex ciphers on the right according to discretion.

**NOTE.**—In forming fractions into decimals, we consider *Numerator*, and *Denominator*, as two distinct whole numbers.

For instance, observe lesson first. We place 1 for a dividend, and 4 for a divisor. We then see that 4 cannot be contained in 1; therefore place a point and annex ciphers to the right of the point.

These ciphers show us how many decimal parts are contained in the dividend; and that the digit,\* 1, is considered as an integer.

In the next place we proceed with Division; when done, begin to count and see where the point must be placed in the quotient. As there is no decimal place in the divisor of lesson 1, begin at the right hand of the quotient and count towards the left, till having a number equal to the decimal places in the dividend: then place our point as on the left side of .25 hundredths. This counting proves its being placed right at first.

## KEY TO CARD No. 26.

### LESSON 2.

What is the decimal of  $\frac{1}{2}$ ?

The numerator is 1. | 2)1.0(.5|| In this lesson it is  
The denominator is 2. | 1 0 || necessary to annex  
one cipher only; consequently there is but one decimal  
place in the dividend. And as there is but one  
figure in the quotient, the point must be placed on  
the left of that figure. Thus, .5 tenths.

\* *Digit*, signifies any number under ten, as, 1, 2, 3, 4, 5, 6, 7, 8, 9.  
O\*

**NOTE.**—The separatrix or point, is in the place of units when reading decimals, and instead of reading units, tens, hundreds, &c. towards the left as in whole numbers, we begin with the point, calling it *units*, and read to the right.

### EXAMPLES.

Call the point, units. .25 units, tens, hundreds : twenty-five hundredths. .5 units, tens : five tenths. .075 units, tens, hundreds, thousands : seventy-five thousandths.

#### LESSON 3.

What is the decimal of  $\frac{3}{4}$ ?  
4)3.00(.75 hundredths,  
28 the answer.

$$\begin{array}{r} \text{---} \\ .20 \\ .20 \\ \text{---} \end{array}$$

#### LESSON 4.

What is the decimal of  $\frac{19}{20}$ ?

$$\begin{array}{r} 20)19.00(59 \\ 180 \\ \text{---} \end{array}$$

$$\begin{array}{r} .100 \\ 100 \\ \text{---} \end{array}$$

...

Ans. .95

#### LESSON 5.

What is the decimal of  $\frac{7}{8}$ ?

Answer, .875

$$8)7.000(.875$$

$$\begin{array}{r} 64 \\ \text{---} \end{array}$$

$$.60$$

$$\begin{array}{r} 56 \\ \text{---} \end{array}$$

$$.40$$

$$\begin{array}{r} 40 \\ \text{---} \end{array}$$

#### LESSON 6.

*Digression 1st.*

What is the amount of .25 .5 .75 .875 and .95 of a pound?

#### *Rule in Addition.*

Begin at the period or units, and place tens under tens, hundreds under hundreds, &c. towards the right; then and as in whole numbers carrying at every ten.

.25 hundredths.	In words, Three pounds,
.5 tenths.	and three hundred and
.75 hundredths.	twenty-five <i>thousandths</i> of a
.875 thousandths.	pound. Or, three tenths,
.95 hundredths.	two hundredths, and five
	thousandths of a pound.
3.325	How shall we know where
Answer, £3.325	to place the decimal point
	in Addition ?

## RULE.

Count that number which has the most decimal places : then begin at the right of the amount and count as many towards the left ; there place the point. The figures on the left of the point are whole numbers.

## KEY TO CARD No. 26.

## LESSON 7.

*Digression 2nd.*

How shall we find the value of £3.325 in pounds, shillings and pence ?

## RULE.

Multiply the decimals by the denominations in pounds, shillings, and pence ; the figures that happen on the left of the point, are whole numbers.

## EXAMPLE.

£3.325	<i>Proof of Lessons 6 and 7,</i>	
20s. in a pound	<i>by mental and practical</i>	
	<i>calculation.</i>	
		£. s. d.
Shil. 6 .500	$\frac{1}{4}$ or .25 of a pound	0 5 0
12d. in a shil.	$\frac{1}{2}$ or .5	0 10 0
	$\frac{3}{4}$ or .75	0 15 0
Pence, 6 .000	$\frac{7}{8}$ or .875	0 17 6
Ans. £3 6s. 6d.	$\frac{19}{20}$ or .95	0 19 0
	Amount,	£3 6 6

## Query.

What is the use of having several sums of money formed into Decimals ?

The benefits arising are many and great: we can then make calculations with ease, by carrying at every ten as in whole numbers. For in all decimal operations, except Duodecimals, we carry at every ten.

## KEY TO CARD No. 27.

## LESSON 8.

What is the decimal of  $\frac{1}{12}$  of a pound?

12)1.000(.08333

96

.40

36

.40\*

36

.40\*

36

.4

*Remarks.*

In the first place we fix the point and annex three ciphers to the 1 thus, 1.000.

Then say, how many times 12 in 100? 8 times and 4 remain.—Bring down the other cipher makes 40.

How many times 12 in 40? 3 times and 4 remain. Then annex a cipher to the remainder and mark it with an asterisk thus, 40\*. Then proceed.

How many times 12 in 40? 3 times and 4 remain. Annex another cipher to the remainder and mark it as before.

Then how many times 12 in 40 again? 3 times and 4 remain; and in this manner 4 would remain continually without end.

We will therefore call this decimal a *surd*,† that is, a number which cannot be reduced to exactness.

Let this decimal be marked with the sign of more, thus, .08333†4.

But whence came this 0 on the left side of the 8?

I will explain it; we had three places of decimals annexed to the 1; then we added two more marked

\* Ciphers added for Decimals.

† A decimal that comes to a close without a remainder, as in Lesson 4, may be called a finite decimal.

*Pence.*

Two shillings I carried make 24 pence and 4 are 28—7 in 28—4.

*Second. Shillings.*

Eight in 11—1 and 3 over I carry to the pence,

*Pence.*

Three shillings over I carried make 36 pence and 4 make 40—How many times 8 in 40?—5.

*Third. Shillings.*

Two in one I cannot; but 1s. makes 12 pence and 5 are 17—two in 17—8 times and 1 over—1 penny makes 4 farthings—2 in 4—2 times.

Thus we find the answer to be 8d. 2q.

## KEY TO CARD NO. 25.

## LESSON 14,

A merchant bought 5 hundred weight of lead for £14 11 8, what was that a pound?

				<i>First. Pounds.</i>	
£.	s.	d.	q.		
5)	14	11	8	Five in 14—2, and £4 over.	
8)	2	18	4	<i>Shillings.</i>	
7)		7	3	£4 over make 80s. and 11 are 91.	
2)		1	0	Five in 91—18 times and 1 over.	
		6	1		

*Pence.*

One shilling over makes 12 pence and 8 are 20—5 in 20—4 times.

£2 18s. 4d. is the price of 112 pounds.

*Second. Pounds.*

Eight in 2—no times, but 2 pounds make 40s. and 18s make 58s.

*Shillings.*

Eight in 58—7 times and 2 over.

*Pence.*

Two shillings over make 24 pence and 4 are 28—8 in 28—3 times and 4 over.

nuteness in most cases of importance ; but for the sake of curiosity in some peculiar calculations, the operator may extend decimals to what length he please.

NOTE.—The remainder of a *surd* must be added in proof.

*Copy the following on your slates, having reference at the same time, to the Table on this page.*

- .1            One, *tenth*.
- .12          Twelve, *hundredths*.
- .123        One hundred and twenty-three, *Thousandths*.
- .1234       One thousand two hundred and thirty-four, *Ten thousandths*.
- .12345      Twelve thousand three hundred and forty-five, *One hundred thousandths*.
- .123456    One hundred twenty-three thousand four hundred and fifty-six, *Millionths*.

Decimals may be read collectively or singly.

*Collectively*, thus: One hundred twenty-three thousand four hundred and fifty-six, *Millionths*.

*Singly*, thus: One tenth, two hundredths, three thousandths, four ten thousandths, five hundred thousandths, six millionths.

## NUMERATION TABLE

IN DECIMALS.

*Copy the Card on your slates.*

- . Units.
- 1 Tenths.
- 2 Hundredths.
- 3 Thousandths.
- 4 Tens of Thousandths.
- 5 Hundreds of thousandths.
- 6 Millionths.

### A CONCISE VIEW OF DECIMAL RULES.

#### *Rule 1. Addition.*

Count the decimal places in the greatest number of

decimal figures of the sum to be added. Begin at the right of the sum total, and count as many towards the left for decimals.

*Rule 2. Subtraction.*

Let the decimal places in the remainder, be equal to the greatest number of decimals in either of the two numbers above singly considered.

*Rule 3. Multiplication.*

The number of decimal places in the product, must be equal to the whole of those in the two factors; and if figures are wanting in the product, prefix ciphers to the left, to supply the defect.

*Rule 4. Division.*

The number of decimal places in the *divisor* and *quotient* counted together, must be equal to those in the *dividend*.

**NOTE 1.** If decimal places be wanting in the *dividend*, annex so many ciphers as you please.

**2.** If there be decimal places wanting in the *quotient*, supply the defect by prefixing ciphers.

These Rules shall be more fully explained, when we work by them separately.

**CASE 2.**

*To find the integral value of a decimal.*

**RULE.**

Multiply the decimal by the *denominations* of the *Integer*, and point off the decimal parts to the right; the left will be integers; as in lesson 7.

**KEY TO CARD No. 27.**

**LESSON 10.**

How many cents in .25 of a dollar?

100 cents make 1 dollar,      .25 multiplied by 100

**Answer, 25cents, 25.00**



By what rule do we point off decimals in multiplication?

By counting the decimal places in both factors; that is in the multiplicand and multiplier: Then begin at the right of the product and count so many towards the left as were in the two factors; there place the point. The figures on the left are integers. See Rule 3, Page 167.

**NOTE.**—If there be not so many figures in the product as are in the two factors, supply the defect by prefixing ciphers to the left hand.

#### EXAMPLE.

Multiply .004 || Here are three decimals in the upper factor, and there is one in the lower; therefore we must have four in the product.  
By .8 || the product.  
Product, .0032 ||

#### REMARKS.

It is of importance to know the place of the *decimal point*; because decimals *decrease* in a tenfold proportion towards the right, as whole numbers *increase* towards the left.

In the above example, if the cipher had not been prefixed, the number would read .032 “thirty-two *thousandths*.” Whereas the true number is “thirty-two *ten thousandths*.”

#### LESSON 11.

What is the value of .5 of a dollar in cents?

$$\begin{array}{r} .5 \times 100 \\ 100 \end{array}$$

Answer, 50.0 cents.

#### LESSON 12,

What number of shillings are in .75 of a pound?

$$\begin{array}{r} 20 \end{array}$$

Answer, 15.00s

#### LESSON 13.

How many cents in .875 of a dollar.

$$\begin{array}{r} .875 \\ 100 \end{array}$$

$$\begin{array}{r} 87.500 \end{array}$$

Answer, 87.5 cents.

In this result or product it may be observed that the fraction is five hundred *thousandths*; but that is the same as fifty hundredths, or five tenths.

**LESSON 14.**

In .8 of a dollar, how many cents?

.8  
100

80.0

Answer, 80 cents.

**LESSON 15.**

In .75 of a shilling how many pence?

.75 × 12  
12

Pence, 9.00

Answer, 9 pence.

**LESSON 16.**

How many shillings in .95 of a pound?

.95 × 20  
20

Shillings, 19.00

Answer, 19 shillings.

**LESSON 17.**

What is the value of .8125 of a shilling?

.8125  
12

Pence, 9.7500

4

Farthings, 3,0000

Answer, 9d. 3q.

**LESSON 18.**

What is the proper quantity of .0625 of a hundred weight, or 112 pounds?

.0625

112

1250

6875

Pounds, 7.0000

Answer, 7 pounds.

**LESSON 19.**

What number of pounds Avoirdupois are in .1875 of a hundred weight?

.1875

112

3750

20625

Pounds, 21.0000

Answer, 21 pounds.

**LESSON 20.**

If 60 pounds of wheat make 1 bushel, how many pounds are in .75 of a bushel?

.75

60

Pounds, 45.00

Answer 45 pounds.

**LESSON 21**

What is the proper value of .790625 of a pound?

$\pounds.790625$	hundred and twenty-five
20s.	<i>Millionths.</i>
<hr/>	
Shillings, 15.812500	LESSON 22.
12s.	What is the proper value of .1875 of a pound
Pence, 9.750000	currency? $\pounds.1875$
4	20s.
<hr/>	
Farthings, 3.000000	Shillings, 3.7500
Answer, 15s. 9d. 3q.	12
Read the above question thus: "seven hundred and ninety thousand six	Pence, 9.0000
	Answer, 3s. 9d.

KEY TO CARD No. 27.

## CASE 3.

## LESSON 23.

Reduce 15s. 9d. 3q. to the decimal of a pound.

How shall we reduce quantities of several denominations, such as shillings, pence and farthings; quarters, pounds, ounces, &c. to a decimal?

## RULE.

1. Begin a column with the least denomination and proceed downwards to the greatest, thus,

Farthings,	3	Ounces,	12
Pence,	9	Pounds,	21
Shillings,	15	Quarters,	2

2. Let ciphers be ideally annexed as they really are in Lessons 3, 4, and 5.

3. Begin at the top and divide each number by its value in the next denomination; that is, farthings by 4, pence by 12, shillings by 20, &c.

4. Place the quotient as a decimal part for each denomination next below. For instance, when dividing farthings, place the quotient on the right of pence. When dividing pence and the decimals annexed, place the quotient on the right of shillings, &c. The last quotient will be the decimal required.

*Operation.*

$$\begin{array}{r} 4 \overline{) 3.} \\ 12 \overline{) 9.75} \\ 20 \overline{) 15.8125} (.790625 \\ \underline{140} \end{array}$$

$$\begin{array}{r} .181 \\ \underline{180} \end{array}$$

$$\begin{array}{r} ..125 \\ \underline{120} \end{array}$$

$$\begin{array}{r} ..50* \\ \underline{40} \end{array}$$

$$\begin{array}{r} 100* \end{array}$$

Ans. .790625 of a pound.

LESSON 24.

Reduce 12s. 6d. 3q. to the decimal of a pound.

$$\begin{array}{r} 4 \overline{) 3.} \\ 12 \overline{) 6.75} \\ 20 \overline{) 12.5625} (.628125 \\ \underline{120} \end{array}$$

$$\begin{array}{r} ..56 \\ \underline{40} \end{array}$$

$$\begin{array}{r} 182. \\ \underline{180} \end{array}$$

$$\begin{array}{r} ..25 \\ \underline{20} \end{array}$$

.50\* continued

$$\begin{array}{r} 40 \\ \hline \end{array}$$

$$100*$$

$$100$$

Answer, .628125

LESSON 25.

Reduce 9d. 3q. to the decimal of a shilling.

$$4 \overline{) 3.}$$

$$12 \overline{) 9.75}$$

$$.8125$$

Answer, .8125

LESSON 26.

Reduce 3q. to the decimal of a shilling.

$$4 \overline{) 3.}$$

$$12 \overline{) 0.75}$$

$$.0625$$

Answer, .0625

LESSON 27.

Reduce 3s. 6d. to the decimal of a dollar of 8s.

$$12 \overline{) 6.}$$

$$8 \overline{) 3.5}$$

$$.4375$$

Answer, .4375

## LESSON 28.

Reduce 7s. 3d. to the decimal of a dollar of 8s.

$$\begin{array}{r} 12 \overline{) 3.} \\ 8 \overline{) 7.25} \\ .90625 \\ \text{Answer, } .90625 \end{array}$$

*Proof by Case 2.*

$$\begin{array}{r} .41666 \div 4 \\ 6 \end{array}$$

$$\begin{array}{r} \text{Shillings, } 2.50000 \\ 12 \end{array}$$

$$\text{Pence, } 6.00000$$

See remarks under lesson 9

## LESSON 29.

Reduce 2s. 6d. to the decimal of a dollar of 6s.

$$\begin{array}{r} 12 \overline{) 6} \\ 6 \overline{) 2.5} \\ .41666 \div 4 \\ \text{Answer, } .41666 \div 4 \end{array}$$

## LESSON 30.

Reduce 3s. 9d. to the decimal of a dollar of 7s. 6d. Jersey currency.

$$\begin{array}{r} 12 \overline{) 9.} \\ 7.5 \overline{) 3.75} (.5 \text{ Answer.} \\ 375 \end{array}$$

... ..

## REMARKS.

1. As 7s. 6d. make a dollar, we must divide by it for our last divisor. And as it cannot be used in its present form, we reduce the 6d. to the decimal of a shilling, viz. .5 and annex this decimal to 7s. thus, 7.5
2. For placing the point in this answer, see *Division*, under Lesson 1.

## LESSON 31.

Reduce 1s. 10d. 2q. to the decimal of a dollar Jersey currency.

$$\begin{array}{r} 4 \overline{) 2.} \\ 12 \overline{) 10.5} \\ 7.5 \overline{) 1.875} (.25 \text{ Answer} \\ 150 \\ \hline .375 \\ 375 \end{array}$$

## LESSON 32.

I wish to prepare £25 17s. 6d. for a common multiplier in making out a tedious Return of Assessments.

What is the number required? Ans. £25.875

*Directions.*

Reduce the 17s. 6d. to the decimal of a pound, and place the 25 pounds on the left of the separatrix.

† For the better understanding of Lesson 32 we will reduce 17s. 6d. into a fraction. Multiply 17s. by 12 the number of pence in a shilling and add the 6d. the product will be 210 for a numerator: multiply 20s. that is one pound, by 12, the product will be 240 for a denominator. Thus we have  $\frac{210}{240}$  of a pound. Now by the rule:—Consider these two numbers as whole numbers, annex ciphers to the numerator for a dividend, and divide by the denominator, the quotient will be the decimal of a pound.

OPERATION.

$$\begin{array}{r} \frac{210}{240} \text{ of a pound. } 240 \overline{)210.000} \begin{array}{l} .875 \\ 192 \text{ 0} \\ \hline .18 \text{ 00} \\ 16 \text{ 80} \\ \hline .1200 \\ 1200 \\ \hline \end{array} \end{array}$$

† NOTE:—By multiplying by a decimal, an integral number is made less in proportion to the smallness of the decimal.

$\begin{array}{r} \text{Multiplied by } \begin{array}{r} \uparrow 48 \\ .75 \text{ or } \frac{3}{4} \end{array} \\ \hline \begin{array}{r} 240 \\ 336 \\ \hline \end{array} \\ \text{Produces, } 36.00 \end{array}$		$\begin{array}{r} \text{by } \begin{array}{r} \uparrow 48 \text{ multiplied} \\ .5 \text{ or } \frac{1}{2} \end{array} \\ \hline \begin{array}{r} 240 \\ \hline \end{array} \\ \text{produces } 12.00 \end{array}$
---	--	--

And to the contrary, by dividing any number by a decimal, the quotient will be of greater magnitude than the dividend. The less the divisor is, the greater will be the quotient.

## EXAMPLES.

† 24. divided by .75, gives 32 for a quotient.      † 24. divided by .5, gives 48. for a quotient.

.75)24.00(32.

.5)24.0(48.

22 5

20

.1 50

.40

1 50

40

...

..

NOTE :—When the number of decimal places in the divisor and dividend are equal, the quotient will be whole numbers.

*Rule in Multiplication of Decimals.*

Point off so many decimals in the product, as there are in the two factors counted together.

## RULE IN DIVISION.

*Of Division.*—The decimals in the divisor and quotient, counted together, must be equal in number to the decimals in the dividend.

## EXAMPLES.

1. Multiply 486.5  
by 3.25

Proof by division.

3.25)1581.125(486.5

1300

24325

9730

14595

.2811

2600

1581.125

.2112

1950

.1625

1625

2. Multiply 24.21  
by 64.8

$$\begin{array}{r}
 27368 \\
 13684 \phantom{0} \\
 \hline
 20526 \phantom{00} \\
 \hline
 2216.808
 \end{array}$$

64.8)2216.808(34.21  
1944

$$\begin{array}{r}
 .2728 \\
 2592 \phantom{00} \\
 \hline
 .1360 \\
 1296 \phantom{00} \\
 \hline
 ..648 \\
 648 \phantom{00} \\
 \hline
 \phantom{000000}
 \end{array}$$

### REMARKS.

1st. In Division, begin by counting the Decimals in the dividend ; then begin again and count the Decimals in the divisor, turn from that to the right of the quotient and continue counting towards the left, till you have a number equal to the Decimals in the dividend ; there place the point.

2d. If, after Division is performed, there is not a sufficient number of Decimals in the divisor and quotient, counted together, then prefix ciphers to the quotient, till the deficiency in number is made good.

3d. When the dividend is too small to admit the divisor, annex cyphers to the dividend ; five in number for a general rule, but sometimes less, and sometimes more, according to the nature of the case under consideration.

END OF PART SIXTH.



## INTRODUCTION TO ARITHMETIC.

### PART VII.

CONTAINING

#### REDUCTION OF WEIGHTS AND MEASURES, AND DUODECIMALS.



#### KEY TO CARD No. 28.

This Rule is used in reducing large denominations to small ones, as, pounds to shillings, pence, &c. called *Reductoin descending*, or in reducing small denominations to large ones, as, farthings to pence, shillings, &c. called *Reduction ascending*; but these niceties are unworthy the attention of men in business: The main thing is to understand how to calculate with accuracy and despatch.\*

We shall therefore attend to such lessons as will most probably happen in the common business of life; and study out those of amusement, when time, circumstances, and propriety will admit.

#### AVOIRDUPOIS WEIGHT.

16 drams, marked dr. make 1 ounce,	oz.
16 ounces make 1 pound,	lb.
28 pounds, 1 quarter of a hundred weight,	qr.
4 quarters, or 112 lbs. 1 hundred weight,	cwt.
20 hundred-weight, 1 ton,	T.
60 pounds 1 bushel of wheat in New-York,	B.
112 pounds a <i>quintal</i> of fish.	ql.

\* *Despatch* is more modern than *dispatch*.

**LESSON 1.**

In 1440 lbs. of wheat, how many bushels?

Answer, 24 B.

*Directions:*

$$1440 \div 60 = 24 \text{ for an answer}$$

That is, 1440 divided by 60 equals 24 for an answer.

$$6 \overline{)144} 0$$

24 B.

**LESSON 2.**

In 18000 lbs. of wheat, how many loads, at 20 bushels each?

Answer, 15 loads.

$$18000 \div 60 \div 20 = 15 \text{ for an answer.}$$

That is, 18000 divided by 60, divided by 20, equals 15 for an answer.

**LESSON 3.**

Bought 4 loads of wheat weighing as follows:

1 load,	1235 lb.
2	1245
3	1231
4	1242

$$6 \overline{)495} 3$$

82 33 lb.

How many pounds and bushels in the whole?

Ans. 4953 lbs. or 82.

B. 33 lbs. over.

**LESSON 4.**

In 14 cwt. 2 qrs. 25 lbs. how many lbs.?

*Directions.*

1. Multiply 14 by 4, the number of quarters in

a hundred weight, and add the 2 qrs. in the given sum makes 58 qrs.

2. Multiply this sum by 28; the number of pounds in a quarter, and add the 25 lbs. of the given sum; which will make for an answer, 1649 lbs.

$$14 \times 4 + 2 = 58.$$

$$58 \times 28 + 25 = 1649.$$

Thus: 14 multiplied by 4 added to 2 equals 58.

58 multiplied by 28 added to 25 equals 1649:

cwt. qrs. lb.

14 2 25

4

58

28

489

116

1649

**LESSON 5:**

Bring 1649 pounds into hundreds, quarters, and pounds.

Ans. 14 cwt. 2 qrs. 25 lbs.

*Directions.*

1649  $\div$  28 = 58 and 25 lb. over.

$$58 \div 4 = 14 \text{ and } 2 \text{ qrs.}$$

over. Read thus:

1649 divided by 28, equals 58 and 25 lb. over.

58 divided by 4, equals 14 and 2 qrs. over.

*Operation.*

28)1649(58 qrs.

140

. 249

224

. 25 lbs.

4)58

14 2 qrs.

**LESSON 6:**

In 33152 ounces, how many hundred weight?

Answer, 18 cwt. 2 qrs.

$33152 \div 16 = 2072$  lb.

$2072 \div 28 = 74$  qrs.

$74 \div 4 = 18$  cwt. and 2 qrs.

over. Read thus,

33152 divided by 16 equals 2072 lb.

2072 divided by 28 equals 74 qrs.

74 divided by 4 equals 18 and 2 qrs. over.

*Operation.*

16)33152(2072 lb.

32

. 115

112

. 32

32

00

lb.

28)2072(74 qrs.

196

. 112

112

000

qrs.

4)74

18 cwt. 2 qrs.

NOTE.—Let all learners understand the ground Rules before meddling with weights and measures.

**TROY WEIGHT.**

24 grains, marked gr. make 1 pennyweight, pwt.

20 pennyweights, 1 ounce, oz.

12 ounces, 1 pound, lb.

By this weight, gold, silver, jewells, electuaries, and all liquors are weighed; but it is seldom used in the United States.

Merchants that receive considerable sums of gold, overseers of the mint, banking houses and silversmiths, make use of this weight.

NOTE.—A carat is the twenty-fourth part of any quantity or weight.

Twenty-two carats of gold, and two carats of copper melted together, make the standard for gold.

Eleven oz. 2 pwts. of fine silver, melted with 18 pwts. of copper, make the true standard for silver coin.

In these cases copper is called *alloy*.

### KEY TO CARD No. 29.

#### LESSON 1.

In 30 lbs. 11 oz. how many pennyweights?

12 ounces in a pound.      Ans. 7420 pwts.

---

371

20 pennyweights in an ounce,

---

7420

#### LESSON 2.

In 8 lbs. 3 oz. 15 pwts. of silver, how many spoons of 4 oz. 15 pwts. each?      Ans. 21 spoons.

#### *Directions.*

Reduce the whole quantity, 8 lbs. 3 oz. 15 pwts. into pennyweights for a dividend.

Reduce the weight of each spoon into pennyweights for a divisor; the quotient will be the answer.

#### *Operation.*

lbs. oz. pwts.

8   3   15

12

---

99 oz.

20

---

1995 pwts. dividend.

oz. pwts.

4   15

20

---

Divisor, 95 pwts

95)1995(21

190

.. 95

95

## KEY TO CARD No. 29,

## LESSON 3.

*Troy Weight.*

A gentleman having 10 lb. 3 oz. of silver, wished to make candlesticks of 1 lb. cups of 6 oz. table spoons of 2 oz. and tea spoons of  $\frac{1}{2}$  an ounce, and to have an equal number of each; what was that number?

Ans. 6 of each.

*Directions.*

1. Reduce the given quantity of silver, viz. 10 lb. 3 oz. to pennyweights for a dividend.

2. Reduce each article to pennyweights and add them. Take the amount for a divisor.

lb. oz.

10 3

12 ounces in a pound.

---

123 ounces.

20 pwt. in an ounce.

---

2460 pwt. the quantity of silver.

lb.

pwt. in a

1 mul. 12 mul. 20 = 240 candlestick.

6 oz. mul. 20 = 120 cup.

2 oz. mul. 20 = 40 table spoon.

$\frac{1}{2}$  oz. = 10 tea spoon.

---

410 Amount.

$2460 \div 410 = 6$  for answer.

CARDS ARE OMITTED AT PRESENT.

## CLOTH MEASURE.

4 nails, marked na. make 1 quarter of a yard, qr.

4 quarters,

1 yard,

yd.

3 quarters,

1 Ell Flemish,

E. Fl.

5 quarters,

1 Ell English,

E. E.

6 quarters,

1 Ell French,

E. Fr.

LESSON 1.

In 75 yards how many quarters and nails?

Answer, 300 quarters, 1200 na.

75 yds.

4 quarters in a yd.

$$300 \text{ qrs. mul. } 4 = 1200 \text{ na.}$$

LESSON 2.

In 1200 nails how many yards?

Ans. 75 yds.

$$1200 \div 4 = 300 \text{ qrs.}$$

$$4 \overline{) 1200}$$

$$300 \div 4 = 75 \text{ yds.}$$

$$4 \overline{) 300}$$

75

DRY MEASURE.

2 pints, marked pt. make 1 quart, qt.

8 quarts, 1 peck, pk.

4 pecks of wheat, or 60 lb. 1 bushel, bu.

LESSON 1.

In 5 loads of wheat, each 21 bushels, how many pecks?

$$21 \text{ mul. } 5 \text{ mul. } 4 = 420.$$

Answer, 420 pecks.

LESSON 2.

A farmer wishes to seed 54 acres with wheat, at the rate of 5 pecks to the acre; how much wheat is required?

Ans. 67 bu. 2 pks.

54 acres,

5 pecks to the acre.

$$54 \text{ mul. } 5 \div 4 = 67 \frac{1}{2}.$$

$$4 \overline{) 270} \text{ pecks.}$$

67 bu. 2 pks.

LESSON 3.

A merchant wishes to transport 504 bushels of flax seed, in casks that will hold 7 bushels each; how many casks are wanted?

Answer, 72 casks.

$$504 \div 7 = 72.$$

WINE MEASURE.

4 gills, marked gi. make 1 pint, pt

2 pints, 1 quart, qt.

Q

4 quarts,	1 gallon,	gal.
31½ gallons,	1 barrel,	bl.
63 gallons,	1 hogshead,	hhd.*
2 hogshead	1 pipe	p.
2 pipes,	1 tun,	T.

NOTE.—231 solid inches make a gallon. See solid or cubic measure.

### LESSON 1. *Wine Measure.*

In 112 gallons how many pints? Answer, 896.  
8 pints in a gallon.

$$\begin{array}{r} \text{—} \\ 112 \text{ mul. } 8 = 896. \\ 896 \text{ pints.} \end{array}$$

### LESSON 2. *Wine Measure.*

A vintner had 2 pipes of wine, each containing 126 gallons, and he wished to draw it off into bottles of 7 gills each; how many bottles were sufficient?

Answer, 1152.

126 gallons in a pipe.  
2 pipes.

—  
252 gallons in all.  
4 quarts in a gallon.

—  
1008 quarts in the whole.  
8 gills in a quart.

—  
÷Gills in each bottle, 7)8064 gills in the whole.  
1152 number of bottles.

### LESSON 3. *Wine Measure.*

If a grocer reduce 126 gallons of brandy, by mixing water equal to one fourth the quantity of brandy, how many gallons will he have in the whole?

Answer, 157 gals. 2 qts.

$$126 \div 4 = 31 \text{ gals. } 2 \text{ qts. over.}$$

$$31 \text{ gal. } 2 \text{ qts. } + 126 \text{ gals. } = 157 \text{ gals. } 2 \text{ qts.}$$

\* A hogshead in the United States is of no certain quantity; it contains from 100 to 125 gallons; but generally about 112.

## LONG MEASURE.

3 Barley corns, or bar.	make 1 inch.	in
4 Inches,	1 hand in measuring horses.	
9 inches	1 quarter of a yard.	
12 Inches	1 foot.	ft.
3 Feet,	1 yard.	yd.
6 Feet,	1 fathom.	fm.
5½ Yards or 16½ feet,	1 rod, pole, or perch.	pr.
40 Poles,	1 furlong.	fur.
8 Furlongs,	1 mile.	mile.
3 Miles,	1 league.	lea.

But, in measuring distances the *Chain* is preferable to the *Rod* or *Pole*.

7.92 Inches,	make 1 link,	L.
25 Links	1 pole or perch.	P.
4 Poles, or 100 links,	1 chain.	ch.
10 Chains,	1 furlong.	fur.
80 Chains or 8 furlongs,	1 mile.	mile.

## LESSON 1.

In 3½ miles how many poles?

3½ miles = 3.5 mul. 8 = 28  
fur. mul. 40 = 1120 P.

*Operation.*

3.5 Miles.

8 Furlongs in a mile.

28.0 Furlongs.

40 Poles in a furlong.

1120 Poles.

Ans. 1120 Po.

## LESSON 2.

In 1122 Poles, how many feet?

16.5 feet = 1 pole × 1122 =

18513.0 feet.

*Operation.*

1122 poles.

16.5 feet in a pole.

5610

6732

1122

Ans. 18513.0 ft.

18513.0 feet.

## LESSON 3.

In 18513.0 feet how many poles? Ans. 1122 poles.

18513.0 ÷ 16.5 = 1122



*Operation.*

16.5)18513.0)1122

165

.201

165

.363

330

.330

330

## LESSON 4.

In 1 mile how many yards?

1 mile=8 fur.  $\times 40=320$ 

poles. 5.5 yards=1 pole.

320 mul. 5.5=1760.

*Operation.*

1 Mile=8 fur.

40 poles in a fur.

320 poles in a mile.

5.5 yards in a P.

160

160

Ans. 1760.0 yards in a mile.

## SESSION 5.

A bridge builder engaging to erect a bridge over a stream  $17\frac{1}{2}$  rods wide, wanted 6 string pieces, each  $17\frac{1}{2}$  rods long; how many feet in length were required?

$17\frac{1}{2}$  rods=17.5 mul. 6=105 rods.

105 rods=16.5 the number of feet in a rod  $\times 1732.5$  feet.

*Operation.*

17.5 rds. length bridge  
6 stringpieces.

105.0 rods in the whole  
16.5 feet in a rod.

525

630

105

Ans. 1732 feet .50  
1732.50 or .5 or  $\frac{1}{2}$ .

## LAND AND SQUARE MEASURE.

*Called Mensuration of Superficies.*

144 square inches make 1 square foot.

9 square feet 1 square yard.

$30\frac{1}{4}$  square yards, or } 1 square rod.

272 $\frac{1}{4}$  square feet

40 square rods 1 square rood.

4 square roods 1 acre.

640 acres in 1 square mile.

Let the first business be to investigate and prove our Table.

## LESSON 1.

Suppose we have 72 boards, each 12 inches wide, and 14 feet long; how many feet in the whole?

Answer, 1008 ft.

72 boards. 14 feet in each board.	72 boards. 14 feet long.
<hr/> 288	<hr/> 288
<hr/> 72	<hr/> 72
<hr/> 1008	<hr/> 1008 ft. 12 in. by 16
Thus we have 1008 feet in the whole; but reduce these square feet into inches, and divide them by 144 number of inches in a foot; see if the result will be 1008.	<hr/> 12
$1008 \times 12 \times 12 = 145152 \div 144 = 1008$ for proof.	<hr/> 12096
1008 ft.	<hr/> 16
12 inches long	<hr/> 72576
	<hr/> 12096
	<hr/> 144)193536(1344 feet.
	<hr/> 144
	<hr/> .495
	<hr/> 432
	<hr/> .633
	<hr/> 576
	<hr/> .576
	<hr/> 576
	LESSON 3.

NOTE.—625 links make one square rod and 100,000 links make one acre. In land measure reduce your work into links, and cut off 5 figures to the right.

## LESSON 2.

How many square feet in 72 boards, each 14 feet long and 16 inches wide?

Answer, 1344 feet.

If the roof of a house be 14 feet from the ridge to the edge of the eaves, and from gable end to gable end 21 feet; how many superficial feet including both sides? An. 588 feet.

$$14 \times 21 = 294 \text{ for one side.}$$

$$294 \text{ mul. } 2 = 588.$$

**SOLID MEASURE.**

By this measure the solid or cubic contents of all things are ascertained which have length, breadth, and thickness.

For instance, a piece of square timber has length, breadth, and thickness. A cord of wood has length, breadth, and height. A bin of grain has length, breadth and depth.

*Denominations.*

1728. solid inches, make	1 solid foot.*
231. solid inches,	1 wine gallon.
268.8 solid inches,	1 gal. dry measure
282. solid inches,	1 beer gallon.
2150.4 solid inches,	1 bushel.
27. solid feet,	1 yard.
40. feet of round timber or	} 1 ton or load.
50. feet of hewn timber,	
128. feet solid measure,	1 cord.

The usual form of a cord, is 8 feet long, 4 feet high and 4 feet wide.

**LESSON 1.**

If a stick of timber be 18 inches in breadth, 15 inches thick, and 28 feet in length, how many solid feet? and how much will it amount to at 8 cents a foot?

Answer, 52½ feet, and it cost 4 dol. 20 cents.

1. Find the superficial content of one end, by multiplying the breadth by the thickness.

2. Multiply this superficial content, by the inches in the length.

3. Divide the last product by 1728, the quotient will be solid feet.

4. If inches remain, multiply them by 12 and divide again by 1728, the quotient will be inches or parts of a solid foot.

**LESSON 2.**

A farmer bought a cider mill wheel by the solid foot; the diameter, that is, the breadth across the

\* 12 mul. 12 mul. 12 makes the inches in a solid foot.

middle, was 5 ft. 9 in. and the thickness 13 inches ; how many solid feet in the wheel ? Answer, 28.

**RULE.**—1. Multiply the square of the diameter by .7854 the product will be the superficial content of the wheel.

2. Multiply the superficial content by the thickness, the product will be the answer, viz: 25.9672875.0

### DUODECIMALS

Are decimals of 10 and 2; or of 12.

This Rule is very convenient for workmen and artificers in casting up the contents of their work: we shall operate with it in the same manner as with compound multiplication, without reducing the several denominations into one number, and shall invariably carry at every twelve till coming to feet.

*The denominations are as follow.*

12 fourths, "" make	1 third.
12 thirds, ""	1 second.
12 seconds "	1 inch.
12 inches, in.	1 foot.

Inches are called *primes* ; but the plainer our expressions the better : call them *inches*.

**NOTE.**—Inches multiplied by feet, produce inches and feet. Inches multiplied by inches, produce seconds and inches. Inches multiplied by seconds, produce thirds and seconds, &c.

*An easy method for calculating with Duodecimals.*

1. Set the multiplicand in usual form : then place the feet of the multiplier under the lowest denomination of the multiplicand, and set the remaining parts of the multiplier off to the right in their natural order.

2. Multiply first with the right hand figure of all, place the first product figure under its multiplier, and proceed in order as in Compound Multiplication.

3. Go through with each denomination in the same manner, placing the first figure under its multiplier towards the left.

**NOTE.**—If there be no feet in the multiplier, supply their place with a cipher.

## LESSON 1.

If the surface of a stone be 8 ft. 6 in. 9 seconds in length, and 7 feet 3 inches 8 seconds in breadth, what is the superficial content? Ans. 62 ft. 6 in. 7'' 9'''

*Operation.*

Ft.	in.	"	'''	''''
8	6	9		
		7	3	8
<hr/>				
	5	8	6	0
2	1	8	3	
59	11	3		

62 6 7 9 0 Answer.

## LESSON 2.

What is the superficial content of a table 8 feet 9 inches 10 seconds, by 5 feet 6 inches 7 seconds?

Answer, 48 ft. 11 in. 2'' 8''' 10''''

*Operation.*

Ft.	in.	"	'''	''''
8	9	10		
		5	6	7
<hr/>				
	5	1	8	10
4	4	11	0	
44	1	2		

Ans. 48 11 2 8 10

## LESSON 3.

A cabinet maker had three pieces of plain furniture finished off by the foot; one piece 4 feet 3 inches long, and 3 feet 7 inches wide; a second piece 5 feet 8 inches long, and 4 feet 5 inches 7 seconds wide; and a third piece 6 feet 9 inches 3 seconds long, and

4 feet 6 inches wide ; how many superficial square feet did the whole contain? An. 71 ft. 0 in. 0'' 2'''

	Ft. in. '' '''				
First piece,	4	3			long.
		3	7		wide.
<hr/>					
	2	5	9		
	12	9			
<hr/>					
Contents,	15	2	9		
	Ft. in. '' '''				
Second piece,	4	5	7		wide.
			5	8	long.
<hr/>					
	2	11	8	8	
	22	3	11		
<hr/>					
Contents,	25	3	7	8	
	Ft. in. '' '''				
Third piece,	6	9	3		long.
			4	6	wide.
<hr/>					
	3	4	7	6	
	27	1	0		
<hr/>					
Contents,	30	5	7	6	
	Ft. in. '' '''				
Contents of the 1st piece,	15	2	9		
2nd.	25	3	7	8	
3rd.	30	5	7	6	
<hr/>					
Total,	71	0	0	2	

## TIME.

60 seconds, marked s. make	1 minute,	m.
60 minutes,	1 hour,	h.
24 hours,	1 day,	d.
7 days,	1 week,	w.
4 weeks,	1 month,	mo.
13 months, 1 day, 6 hours,	1 Julian year,	yr.

*Explanation of the origin of the Julian year.*

The Romans called the first day of each month *calends*. Julius Cæsar, a character similar to Bonaparte, regulated the calendar about 50 or 60 years before the birth of Christ. Julius found, that 365 days were about 6 hours short of the true year: he decreed that the 24th day of February, in every fourth year, should be reckoned twice. This reckoning taking place 6 days before the calends of March, and one day being reckoned twice, gave it the appellation, *bissextilis*, which is literally, *the sixth of the calends twice*. But the Gregorian calendar, instituted by pope Gregory the XIII, in 1582, and adopted by the British government in 1752, which we now use, and is called new style, drops three days of the Julian calendar in 400 years, and makes the year equal to 365 days 5 hours 49 m. 12 sec.

**PERIODICAL YEAR.**

Astronomers say, that the true periodical year, is calculated from "the time of the earth's period about the sun, in departing from any fixed point in the heavens, and returning to the same again;" it consists of 365 days, 6 hours, 9 minutes and 14 seconds.

**TROPICAL YEAR.**

The tropical year contains 365 days, 5 hours 48 minutes and 57 seconds—An explanation of its origin belongs to astronomers.

**LESSON 1.**—How many days from 15th January to the 19th August inclusive? Answer, 216 days.

Look in your Almanack, say,

In January,	16 days.
February,	28
March,	31
April,	30
May,	31
June,	30
July,	31
August,	19

Answer, 216

**LESSON 2.**

In 216 days, how many weeks?

Answer, 30 weeks 6 days.

7 d. in a w. ÷ by 7)216.

30 w. 6 d.

## LESSON 3.

How many years from 1776 July 4th, to the 4th July 1816?      25th October, 1755, how old will he be on the first of November 1815?

Ans. 60 y. 6 d.

Answer, 40 years.

1616

1815

1776

1755

.. 60

... 40

October having 31 days, there are 6 days after his birth-day in the year 1815.

## LESSON 4.

If a man was born on the birth-day in the year 1815.

## LESSON 5.

How many days from the birth of Christ, to Christmas, 1815, allowing each year to contain 365 days and 6 hours?      Answer, 662928 d. 18 h. over.

## LESSON 6.

George Washington, the American patriot, was born 22nd February, 1732, and died 14th of December, 1799; what was his age?

Ans. 67 y. 10 m. 2 w. 1 d.

## REDUCTION OF MONEY.

*The denominations of English money are inserted in Card No. 12.*

## LESSON 1.

In £2691-13s. 2d. how many pence?      Ans. 645998d.

*Operation.*

2691 pounds 13s. 2d.

20 shillings in a pound.

53833 s.

12 pence in a shilling.

645998d.

When multiplying by 20, add in the 13s. when multiplying by 12, add in the 2d.

## LESSON 7.

In 87600 pence, how many pounds?      Ans. £365.



*Operation.*

$$\begin{aligned} 87600 \div 12 \\ = 7300 \div 20 \\ = 365 \end{aligned}$$

**LESSON 3.**

In £916 10s. 9d. 3q.  
how many farthings?

Answer, 879879qrs.

*Operation.*

£	s.	d.	q.
916	10	9	3
20			

---

18330s.

12

---

219969d.

4

---

879879qrs.

$$\begin{aligned} 916 \times 20 + 10 &= 18330 \times \\ 12 + 9 &= 219969 \text{ mul. } 3 \\ &= 879879. \end{aligned}$$

**LESSON 4.**

In £77 14s. 7d. 2q.  
how many half pence?

Ans. 37311 half-pence.

£	s.	d.	q.
77	14	7	2

20s. in a pound.

---

1554 shillings.

12d. in a shilling.

---

18655 pence.

2 qrs. in a half-pence.

---

37311 half-pence.

\* 4 pence make 1 groat.

$$\begin{aligned} 12)87600 \\ 2|0)730|0 \\ \text{£}365 \end{aligned}$$

**LESSON 5.**

In 37311 half-pence,  
how many pounds? An-  
swer, £77 14s. 7d. 2qrs.

*Operation.*

$$\begin{aligned} 2(37311 \text{ half-pence.} \\ 12)18655 \text{ 1 half-penny} \\ \text{[over, or } 2q. \\ 2|0)155|4 \text{ 7d. over,} \end{aligned}$$

£77 14s. over.

**LESSON 6.**

In £160 15s. 6d. how  
many six-pences? Ans.  
6431 six-pences.

*Operation.*

$$\begin{aligned} \text{£}160 \quad 15 \quad 6 \\ 20 \end{aligned}$$

---

3215 shillings.

2 six-pences in a shil.

---

6431 six-pences.

**LESSON 7.**

In £194 10s. 8d. how  
many groats? Ans. 11672  
groats.

*Operation.*

$$\begin{aligned} \text{£}194 \quad 10 \quad 8 \\ 20 \end{aligned}$$

---

3890 shillings.

3 groats in a shilling.

---

11672\* groats in all.

## LESSON 8.

In £272 12s. 6d. how many two-pences? Ans. 32715.

*Operation.*

£272 12 6

20

5452 shillings.

6 two-pences in shill.

32715 two-pences in all.

NOTE.—The 6d. make 3 two-pences which are added in the last product.

## LESSON 9.

In 6431 six-pences, how many pounds? Ans. £160 15s. 6d.

*Operation.*

2)6431 six-pences.

2)0321|5s. 1 six-pence [over.

£160 and 15s. 6d. over.

## LESSON 10.

In 35016 groats how many pounds? Ans. £583 12s.

*Operation.*

3)35016 groats.

2)01167|2 shillings.

£583 12s.

## LESSON 11.

In 1678 dollars of 7s. 6d. each, how many six-pences?

Answer, 25170 six pences.

1678 dols.

15 six-pences=7s. 6d.

8390

1678

25170

END OF PART SEVEN.

R

# INTRODUCTION TO ARITHMETIC, PART VIII.

CONTAINING  
PROPORTION AND INTEREST.



PROPORTION, is commonly called the *Rule of Three*; because a question or problem in this rule, has three numbers given to find a fourth ; and in ancient times it was called "*the golden Rule of Three*," by reason of its usefulness : For, by this rule, we can solve many crafty, critical, and astonishingly curious questions, which could not be done without knowing this method in calculation.

## EXAMPLE,

If 2 bushels of corn cost 6 shillings, what will 4 bushels cost ?

## RULE.

Multiply the second and third numbers together, and divide their product by the first ; the quotient will be the fourth number or answer.

<i>Operation,</i>	b.	s.	b.
	2	: 6	:: 4
			6 second number.

---

First number,	2)24 product.
Quotient,	12s. answer.

This answer can be calculated mentally, that is, by the mind, and very soon too ; but such easy examples are most likely to inspire a learner with the knowledge of new rules, whereby he can solve problems of a more difficult nature.

These numbers are called terms ; the first term, the second term, the third term, and the -fourth term.— See Lesson A. Card 31.

In stating a question, we place a colon between the first and second term, two colons between the second and third, and if the fourth number be known, we place one colon between the third and fourth, thus,  $2 : 6 :: 4 : 12$  and we read them as follows ; as 2 are to 6 ; so are 4 to 12, that is, 2 bear the same proportion 6, as 4 do to 12.

Let us scan another example : If 2 bushels of oats cost 4 shillings, what will 7 bushels cost ?

Here 2 bushels cost 4 shillings, which is at the rate of 2 shillings a bushel ; consequently, 7 bushels will cost 14 shillings, because 7 times 2 are 14 ; thus the first term 2, bears the same proportion to the second, as the third term 7, does to the fourth. See Lesson B. Card 31.

*How to know which is the first, second, and third term, before a question is stated.*

The first term is a supposition, as, “ *If 2 bushels cost,*” or “ *Suppose 2 bushels cost.*”

The second term is that which bears the name of the answer, as “ *4 shillings.*”

The third term is of the same name of the first, and expresses a demand, by asking a question, as “ *What will 7 bushels cost ?*”

Here our ideas are naturally led to shillings for the fourth term or answer, because the second term was in shillings.

And if the *second* term had been in pence, or gallons, or quarts, or feet, or inches, &c. the fourth term would be of the same name as the *second*.

### EXAMPLE.

If 2 shillings will buy 4 quarts of vinegar, what quantity will 8 shillings buy ?

In this case the second term is in quarts, and the answer must be likewise in quarts.

Many more particulars which belong to the rule of three, must be taken into consideration; but we will pass on with a few lessons before the mind is confused with too much criticism.

### KEY TO CARD No. 31.

*Lesson 1.*—If 5 pounds of butter cost 80 pence, what will 9 pounds cost?      Ans. 12 shillings.

*Operation.*    lb.      d.      lb.  
                     5    :    80    :: 9 to a fourth number.

That is to say, as 5 lb. are to 80d.; so are 9 lb to a fourth number. Multiply the second and third terms together and divide by the first. The quotient or answer will be in pence.

Divide those pence by 12 to reduce them into shillings.

80 the second term;  
 9 the third term.

First term,    5)720  
                   12)144 pence or fourth term.  
 Answer,        12 Shillings.

### KEY TO CARD No. 31.

*Lesson 2.*—If 5 pounds of butter cost 80 pence, how much will 1 pound cost?      Ans. 16 pence.

lb.      d.      lb.  
       5    :    80    :: 1 to a fourth number.

That is to say, as 5 lb. are to 80 pence; so is 1 lb. to a fourth number or answer.

Here, the third term being 1, it makes multiplication useless; therefore only divide the second term by the first, the quotient will be the answer.

*Operation.*            5)80  
                               16d.

As the second term was in pence, so the answer is in pence.

*Lesson 3.*—If 1 lb. butter cost 16 pence, what will 5 lb. cost?      Answer, 80 pence.

In this case division is unnecessary, because the first term is 1; therefore a multiplication of the second and third term, will give the answer.

$$\begin{array}{ccccc} \text{lb.} & & \text{d.} & & \text{lb.} \\ 1 & : & 16 & :: & 5 \text{ to a fourth number.} \end{array}$$

That is, as 1 lb. is to 16d. so are 5 lb. to a fourth number; and, as the second term is in pence, so the answer must be in pence also.

16 second term.

5 third term.

---

80 fourth term, or answer.

**KEY TO CARD No. 31.**

*Lesson 4.*—Bought 8 pieces of chints for £57 12s. what must I pay for 12 pieces at that-rate?

Answer, £86 8s.

Reduce the sum £57 12 into shillings, viz. 1152s.

Then say,

$$\begin{array}{ccccc} \text{pieces.} & \text{s.} & & \text{pieces.} & \\ 8 & : & 1152 & :: & 12 \text{ to a fourth number.} \end{array}$$

Read the statement thus; as 8 pieces are to 1152 shillings, so are 12 pieces to a fourth number.

*Operation.* 1152 second term.

12 third term.

---


$$8)13824$$

1728 shillings or fourth term.

Here remember that when the fourth term is in a low denomination, it must be reduced to its proper quantity; as, pints to gallons; inches to feet; pounds to hundreds; and, as in this case, shillings to pounds. Therefore divide the sum 1728 shillings, by 20, the answer will be £86 8s.

$$20)1728$$

£86 8s.

*Lesson 5.*—Suppose the aforesaid pieces of chints contain 432 yards in the whole, and cost £86 8; how much is that a yard?

Ans. 4 shillings.

Here the third term being one, division only is necessary.

$$\begin{array}{rcccc} \text{£}86 \text{ } 8\text{s.} & = & 1728\text{s.} & & \text{yds.} & & \text{s.} & & \text{yd.} \\ & & & & 432 & : & 1728 & :: & 1 \end{array}$$

Read thus, "as 432 yards are to 1728 shillings: so is 1 yard to a fourth number."

$$\begin{array}{r} \text{Operation.} \quad 432 \overline{)1728} (4\text{s. the Answer,} \\ \underline{1728} \end{array}$$

....

### KEY TO CARD No. 31.

*Lesson 6.*—If 6 horses eat 9 bushels of oats, how much will 24 horses eat in the same time?

Answer, 36 bushels.

But, some of those particulars before mentioned, must come under consideration: In the *Rule of Three*, there are two sorts of proportion; *direct*, and *inverse*.

That part which we have already scrutinized, is *direct* proportion; yet we know not *why* it is *direct*. In every problem\* there are certain signs by which we can know *direct* from *inverse* proportion.

1st. When *more* requires *more*, the proportion is *direct*.

If the third term be greater than the first, and the nature of the question shows that the answer must be greater than the second term, then *more* requires *more*.

### EXAMPLE.

If one bushel of salt cost 8 shillings, what will 2 bushels cost?

Here the third term is greater than the first, and we readily perceive that the answer must be greater than the second term. Again,

2nd. When *less* requires *less*, the proportion is *direct*.

\* Problem, a question, a mathematical question.

If the third term be less than the first, and the nature of the question shows that the answer must be less than the second, then *less* requires *less*.

EXAMPLE.

If 4 pounds of sugar cost 6 shillings, what will one pound cost?

Here the third term is less than the first, and the nature of the question shows that the answer must be less than the second.

Let us become masters of *direct* proportion, and then contrive some rules whereby we can distinguish that which is *inverse*.

KEY TO CARD No. 31.

*Lesson 7.*—If buttons cost 50 shillings a gross, what will 1 dozen cost? Answer, 50 pence.

*NOTE.*—144 make one common gross; and whatsoever number of shillings any articles cost by the gross, so many pence they will cost by the dozen; and whatever number of shillings any articles cost by the dozen, so many pence will be the price of one.

INVERSE PROPORTION.

We must now study *inverse* proportion. When the third term is greater than the first, and the nature of the question requires the fourth term to be less than the second, then the proportion is *inverse*. This is called *more* requires *less*.

EXAMPLE.

If 4 men harvest a field of wheat in 2 days, in what time can 8 men do the same work?

Answer 1 day.

RULE.

Multiply the first and second terms together and divide the product by the third, the quotient will be the fourth term or answer.



<i>Operation.</i>	men.	d.	men.
	4	: 2	:: 8
	2		

8)8(1 day, answer.

In this example the fourth term is as much less than the second, as the third is greater than the first : For, 8 is twice the quantity of 4, but 1 is only half the quantity of 2. Therefore this sort of proportion is properly named *inverse* ; or, *indirect*, or if you please, *contrary*. Again.

When the third term is less than the first and requires the fourth to be greater than the second, the proportion is also *inverse*.

This is called *less requires more*.

#### EXAMPLE.

If 12 persons in a family have provisions for 36 days, how many persons will the same provisions serve 18 days?

Answer, 24 persons.

d.	p.	d.
36	: 12	:: 18 to a fourth number, 24.

That is to say, if 36 days require 12 persons to devour the food, what number of persons will 18 days require ?

Here the third term is less than the first and requires the fourth to be contrary, that is, as much greater than the second.

For, the third term is only half the quantity of the first, but the fourth term is double the quantity of the second.

We will now make a memorandum which must be learned so perfectly, that it will always be ready in the mind ; that is to say,

**DIRECT PROPORTION** is known by, *more requires more*, or, *less requires less*. And,

**INVERSE PROPORTION** is known by, *less requires more*, or *more requires less*.

# THE SINGLE RULE OF THREE MADE DIRECT IN ALL CASES.

## RULE.

Compare objects with objects of the same name and kind; as, prices with prices, or dollars with dollars, shillings with shillings, bushels with bushels, gallons with gallons; ounces with ounces &c. for the two first terms; then place that which is of the same name of the answer, in the third term.

### EXAMPLE 1:

If 2 gallons cost 8s. what will 4 gallons cost?

g.	g.	s.	
2	:	4	:: 8 to a fourth
			4 number
—			
2)32(16s. answer			

*Proportional Statement:*  
When the nature of the question shows that the answer must be *greater* than the sum in the *demand*, then take the *lesser* term in the *supposition* for the first; but if it appear that the answer must be *less* than the *demand*, then take the *greater* term in the *supposition* for the first.

### EXAMPLE 2.

If 4 men can do a piece of work in 10 days, how many men will be sufficient to do the same in 20 days?

D.	D.	M.	
20	:	10	:: 4
			4
—			
20)40(2 men, for answer			

Although this question is of the inverse kind, yet the method of stating affords a direct operation, and will hold good in all cases.

### EXAMPLE 3.

If 6 men can do a piece of work in 5 days, how many men can do the same in 15 days?

Answer, 2 men.

In this example we perceive, that the answer in men will require a less number than 6 mentioned in the

supposition ; therefore take the greatest number of days, in the supposition and demand, for the first term, and the other for the second.

*Operation.*

D.	D.	M.	Say, as 15 days are to 5 days, so are 6 men to a fourth number, or the number of men required.
15 :	5 ::	6 to a fourth	
	6	number.	
—			
15)	30(2	answer.	

LESSON 4.—If 270 dollars a year, will supply 12 persons in a family with wheat at 187½ cents a bushel how many persons will the said 270 dollars supply with bread, when wheat is at 125 cents a bushel?

Answer, 18 persons.

LESSON 5.—If 100 cents make 4s. 6d. or 54 pence sterling, what sum will 100 dollars make in sterling currency?

Ans. £22 10s.

LESSON 6.—If 4s. 6d. or 54 pence sterling make 100 cents, what sum will £45 9 sterling make in cents?

Ans. 20200 cts. or 202 dol.

NOTE.—In England a dollar contains	4s 6d
In South Carolina and Georgia,	4 8
In Nova Scotia and the Canadas,	5 0
In New England, Virginia, Kentucky, and Tennessee,	6 0
In New Jersey, Pennsylvania, Delaware, and Maryland,	7 6
In New-York and North Carolina,	8 0

About 48 years past, North Carolina estimated the dollar at ten shillings, by a law of that state.

CONTRACTIONS IN THE RULE OF  
THREE.

RULE 1.—Divide the second term by the first, and multiply that quotient by the third.

EXAMPLE.—If 3 yards of cloth cost £3 18s. 6d. what will 12 yards cost?

Ans. £15 14s.

$$\begin{array}{ccccccc}
 \text{Yds.} & & \text{£} & \text{s} & \text{d.} & & \text{Yds} \\
 \div 3 & : & 3 & 18 & 6 & : : & 12 \\
 & & & 1 & 6 & 2 & \text{quotient.} \\
 & & & & & 12 & 
 \end{array}$$

£15 14 0 answer.

**RULE 2.**—Divide the first term by the third, and divide the second by that quotient.

**EXAMPLE.**—Bought four parcels of indigo, each 3 pounds, for 39 dol. or 3900 cents; how much did 5 pounds cost? Answer, 16 dols. 25 cents.

$$4 \text{ parcels} \times 3 = 12 \text{lb.}$$

lb. cents	lb.		150 continued.
12 : 3900 :: 5			144
5)12			
2.4)3900(1625 cts. or			. . 60
24 [16 dol. 25 cts.			48
150 continued.			120*
			120

**RULE 3.**—Divide the third term by the first, and multiply that quotient by the second.

**EXAMPLE.**—Bought 5 bushels of salt for £2 2s. 1d. what will 25 bushels cost at that rate?

Ans. £10 10s. 5d.

bu. £. s. d.	bush.		£2 2 1 second term.
5 : 2 2 1 : : 25	5)25		5 quotient.
Quotient and multiplier, 5			
			10 10 5 Answer.

**RULE 4.**—Divide the first term by the second, and divide the third by that quotient.

**EXAMPLE.**—If I give 7 dol. and 50 cents for 30 lb. sugar, what must be paid for  $\frac{1}{2}$  a hundred or 56 lb.?

Answer, 14 dollars.

\* A decimal added to balance the decimal in the divisor.

lb.      dol.      lb.

30 : 7.50 : : 56

7.50)30.00(4 quotient.

4)56

3000

14 dollars.

**RULE 5.**—Divide the first term by the third, and multiply the second by the quotient.

**EXAMPLE.**—If I have 36 cwt. carried 50 miles for 18 dollars, how far may I have 12 cwt. carried for the same money?      **Answer,** 150 miles.

cwt.   m.   cwt.

36 : 50 : : 12

Inverse proportion,

12)36

50 second term,

3

3 quotient.

150 miles.

**RATE-BILL.**—Suppose a school to consist of 32 pupils, subscribed for by the proprietors; that a Master teaches during the term of one quarter, or 71.5 days, at 17 dollars and 16 cents a month, and his wages amount to 51 dollars 48 cents; that the whole number of days which each scholar has attended, being added together, make 2288; and that A has sent 214.5 days, B, 71.5, C, 143, &c. how shall we know what each man has to pay, without making a statement in the Rule of Three for each one's quota?

**RULE.**—1. As the whole number of days, is to the whole sum; So is one day to a common multiplier.

2. Multiply each man's number of days by this common multiplier, the product will be the quota sought.

### EXAMPLE.

days.	cents.	day.		11440
2288 :	5148.00 :	1		11440
2288)	5148.00(2.25	cents		
4576	[for one day.			....
<u>5720</u>				
4576				

A, sent 214.5 days.  
Multiplier, 2.25

10725  
4290  
4290

Quota, 482.625

B, sent 71.5 days.  
Multiplier, 2.25

3575  
1430  
1430

160.875 quota.

C, sent 143 days.  
Multiplier, 2.25

715  
286  
286

321.75 quota.

Names	days.	\$	cts	decimal
A	214.5	4	82	.625
B	71.5	1	60	.875
C	143.	3	21	.750

When the first decimal figure happens over five, add one cent. For instance, make A's quota 83, B's 61, and C's 22, rejecting the fractions.

### INTEREST.

Interest is a sum of money allowed by the borrower to the lender. For instance, A, borrows 400 dollars of B, for one year, and agrees to pay B, 7 dollars for the use of every hundred dollars. This is called 7 per cent.; 7 dollars being the rate per cent.\*

In this case the sum 400 dollars is called the *principal*, 28 dollars the *interest*, and the interest added to the principal, makes 428 dollars, which sum is called the *amount*.

LESSON 1.—If 100 dollars in one year will give 7 dollars interest, what will 400 dollars give in five years?

Answer, 140 dollars.

Although interest is calculated by the Rule of Three, yet there is a short and easy way without a formal statement.

\* *Rate per cent.*, signifies a price fixed by the hundred.

*Rate per cent. per annum*, signifies the price fixed by the hundred by the year.

**RULE.**—Multiply the principal by the rate per cent. and divide that product by 100, the quotient will be the interest for one year.

Then, multiply the interest of one year by the time, the product will be the answer.

**EXAMPLE.**

400 dollars principal.

7 per cent.

Interest, 28|00    This number 2800 is divided by 100  
Time,    5    Years.

140 dollars interest in 5 years.

**LESSON 2.**—What is the amount of a note of hand for 14 dollars 37½ cents on interest 2 years, at 7 per cent. per annum?    Answer, \$16 38.75 cents.

Reduce the given sum or principal to cents. 14 dolls. 37½ cents = 1437.5 cents.

1437.5 cents.

7 per cent.

10062.5

2 years.

201|25.0 divided by 100.

Here the interest for 2 years appears to be 201 cents and .25 hundredths of a cent; which sum added to the principal, makes 1638.75 cents, or, 16 dollars 38 cents and .75 hundredths of a cent.

Statement, }

1437.5 cents, principal.  
201.25            interest.

1638.75 amount.

**LESSON 3.** See Card No. 32.

What is the interest of £13 17s. 6d. for one year at 6 per cent.?    Ans. £0 16s. 7d. 3qrs. and 20 hundredths of a farthing.

£13 17 6    principal.

6    rate per cent.

83   5   0

20

N. B. Cutting off two figures to the right hand, divides by 100.

d.	16	85
		12
d.	7	80
		4
q.	3	20

### LESSON 4.

What is the interest of 155 dollars for one year, at  $2\frac{1}{2}$  per cent.?

Ans. 387 cents  $\frac{50}{100}$  of a cent.

155 dol. = 15500 cents principal.  
2

31000 product.  
7750 half the principal.

387|50 divided by 100.

In this case annex two ciphers to the dollars, to reduce them into cents, then multiply by 2 and add half the principal to that product.

### LESSON 5.

What is the interest of 231 dollars for a year at  $3\frac{1}{4}$  per cent? Ans. 750 cents  $\frac{75}{100}$  of a cent.

Multiply the principal by 3 and add  $\frac{1}{4}$  of the principal to that product. Total, 750|75 divi'd by 100

23100 cts. principal  
3

69300 product.  
5775 a 4th part of [the princ'l]

Another way by decimals. See Card 32.

One fourth equals .25; therefore, multiply by 3.25 for the rate per cent.?

23100 cents principal.

3.25 or  $3\frac{1}{4}$  rate per cent.

1155  
462  
693

750|75.00 divide by 100 after pointing off decimals.



**Lesson 6.**—What is the interest of £8 16 10 for  $1\frac{1}{2}$  year, at 7 per cent.? Ans. £0 18s. 6d. 3q.

£8 16 10 prin.

7 rate per cent.

<hr/>					
61 17 10					
<hr/>					
20			s.	d.	q.
<hr/>			12	4	2
			one year's interest.		
			6	2	1
			half a year's interest.		
<hr/>			18	6	3
			one and a half year.		
s. 12		37			
		12			
		<hr/>			
d. 4		54			
		4			
		<hr/>			
q. 2		16			

**Lesson 7.**—What is the interest of 700 dollars for 3 years and  $\frac{3}{4}$ , at 7 per cent. per annum?

Answer, 18375 cents.

70000 cents principal.

7 rate per cent.

---

4900|00 divided by 100.

4900 cents interest for one year.

3 number of years.

---

14700 for 3 years.

2450 for  $\frac{1}{2}$  year.

1225 for  $\frac{1}{4}$  of a year.

---

18375 cents interest for  $3\frac{3}{4}$  years.

**Lesson 8**—What is the interest of 35 dol.  $37\frac{1}{2}$  cents for 1 year, at 5 per cent.? Ans. 176.875 cents.

When the rate per cent. is five, divide the principal by 20; the quotient will be the interest for 1 year: this can be easily scanned, because 5 times 20 make 100, and we can have 5 times 20 in 100.

35 dol. 37½ cents = 3537.5 cents.	
÷ by 5 and	5)3537.500 principal.
by 4 will	4)707.500
be the	176.875 answer in cents.
same as	
20.	

By this 5 per cent. we can prove any sum of interest of any rate per cent. ; for instance, if the rate per cent. be 6, first take one twentieth part of the principal, which quotient will be the interest for one year at 5 per cent. ; then one fifth of that interest added, will make a sum equal to one arising from 6 per cent ; and two-fifths added will make a sum equal to one of 7 per cent., &c. Again, subtract one fifth and we have a sum equal to one of 4 per cent. ; subtract two fifths, we have a sum of 3 per cent., &c. &c.

This is an easier way to prove sums in interest, than by the Rule of Three.

*For example see,*

**Lesson 9**—What is the interest of 250 dollars for 1 year, at 7 per cent ?      Answer, 1750 cents.

250 dol. = 25000 cents.	
Principal.	÷ 20)25000 principal.
25000	5)1250 In. for 1 yr. at 5 pr. ct.
7	250
	250 } two fifths added.
1750 00 Answer.	
	Proof, 1750 cents.

**Lesson 10.**—What is the interest of £165 8s. 4d. for 4 years, at 6 per cent. per annum ? Ans. £39 14s.

$\text{£}165 \ 8 \ 4$  principal.  
 $\text{£} \ s. \ d. \ || \ \text{£} \ s. \ d.$   
 20)165 8 4 || 8 5 5 quotient.  
 160

$\dots 5$  ||  $\text{£}8 \ 5 \ 5$  from 5 per cent.  
 20 || 1 13 1 one fifth.

108 || 9 18 6 by 6 per cent.  
 100 || 4 number of years.

$\dots 8$  ||  $\text{£}39 \ 14 \ 0$  Answer.  
 12 ||  
 100 ||

**Lesson 11.**—What is the amount of  $\text{£}35 \ 15 \ 10$  for 3 years, at 6 per cent per annum?

Answer,  $\text{£}42 \ 4s. \ 8d. \ 0.8q.$

$\text{£}35 \ 15s. \ 10d.$   
 6

$\text{£}2 \ 14 \ 15 \ 0$  ||  $\text{£}2 \ 2 \ 11$  1.6q for 1 year.  
 20 || 3 No. of years.

$s. \ 2 \ 95$  Interest, 6 8 10 0.8 for 3 years.  
 12 || 35 15 10 principal.

$d. \ 11 \ 40$  ||  $\text{£}42 \ 4 \ 8$  0.8 amount.  
 4 ||

$q. \ 1 \ 60$   
 10  
 600

*Proof of Lesson 11.*

£.	s.	d.	£.	s.	d.	q.
20)35	15	10	1	15	9	2 quotient.
20						
15						
20			£1	15	9	2 at 5 per cent.
				7	1	3.6 one fifth.
20)315						
20			2	2	11	1.6 at 6 per cent.
						3 No. of years.
115						
100			6	8	10	0.8 interest.
			35	15	10	principal.
.15						
12			42	4	8	0.8 amount.
20)190						
180						
10						
4						
20)40						

By multiplying the remainder after the farthings, by 10, we find the decimal of a farthing. In the above there remained 3; 3 times 10 is 30; 5 in 30? 6 times; this gives .6 of a farthing.

BROKAGE.

Is an allowance of a certain number of shillings and pence on every hundred pounds, or of a certain number of cents on every hundred dollars.

*Lesson 12.*—Suppose my friend sells goods for me to the amount of £415 16s. 8d. what will his brokerage be at the rate of 5s. on a hundred pounds?

Answer, £1 0s. 9d. 2q.

RULE.

As £100,

is to the rate per cent.;

So is the principal,

to the brokerage required.

Reduce the shillings and pence to the decimals of a pound, and annex them to the pounds for a third term. Look at your Rule in Decimals.

12	d. 8.000	£.	s.	£.
20	s. 16.667(.83335	100	: 5 ::	415.83335
	160			5
	<hr/>			
	. 66		s. 20	79.16675
	60			12
	<hr/>			
	. 67		d. 9	5000100
	60			4
	<hr/>			
	. 70*		q. 2	00004
	60			
	<hr/>			
	100*			

### Proof of Lesson 12.

**Rule.**—Divide the principal by 100; then divide that quotient by the aliquot parts of a pound arising from the rate per cent.

**Illustration.**—5s. = one fourth of a pound; 4s. = one fifth of a pound; 6s. = one fourth of a pound and one fifth of that fourth; 6s. 8d. = one third of a pound; 2s. 6d. = one eighth of a pound, &c.

### EXAMPLE.

£ 4	15	16	8	£.	s.	d.	q.
	20			5s = $\frac{1}{4}$	4)4	3	2 0 quotient
	<hr/>			of a pound. }	1	0	9 2 proof.
s. 3	16						
	12						
	<hr/>						
d. 2	00						

**Lesson 13.**—What is the brokerage of 350 dollars at the rate of 60 cents on 100 dollars?

Answer, 210 cents.

$\begin{array}{r|l} \$ & \text{cts.} \\ 100 : 60 : : 350 & \text{The answer will be in cents when} \\ & \text{the second term is cents.} \\ & 60 \\ & \hline & 210|00 \end{array}$

**Lesson 14.**—What is the brokerage of 455.25 dollars, at the rate of 70 cents on a hundred dollars?

Answer, 318 cents .675 of a cent.

### INTEREST FOR DAYS.

**Rule.**—"As 365 days are to the interest of the given sum for one year;

So is the time proposed, to the interest required."

**Lesson 15.**—What is the interest of 5075 cents for 90 days, at 7 per cent. per annum?

Answer, 87.59 cents.

**Rule for proof.**—Multiply the principal in cents by the rate per cent., and that product by the number of days for a dividend. Multiply 365 by 100 for a divisor; the quotient will be the answer in cents.

*An easier method of finding the interest for days or months in the course of ordinary business.*

Suppose 1 month or 30 days to be  $\frac{1}{12}$  part of a year, and that 1 day is  $\frac{1}{30}$  of a month; then from the following table we can take any part of a year at an instant.

1 day equals $\frac{1}{30}$ of a month	6 months equal $\frac{1}{2}$ of a year.
2 $\frac{1}{15}$	4 $\frac{1}{3}$
3 $\frac{1}{10}$	3 $\frac{1}{4}$
5 $\frac{1}{6}$	2 $\frac{1}{6}$
6 $\frac{1}{5}$	1 $\frac{1}{2}$
8 $\frac{1}{4}$	1 $\frac{1}{3}$
10 $\frac{1}{3}$	
15 $\frac{1}{2}$	

**Lesson 16.**—What is the interest of a note given on the first day of January, 1815, for 34 dollars and 50 cents, payable on the 6 of February, 1816, with interest at 7 per cent. per annum?

Answer, 266.32 cents.

3450 cents principal.  
7 rate per cent,

241|50 interest of 1 year  
cents.

30 days  $\frac{1}{2}$  12|241.50

6 days  $\frac{1}{6}$  of  $\frac{1}{2}$  5|20.125

1 day  $\frac{1}{6}$  of  $\frac{1}{6}$  6|4.025

0.670+

Answer, 266.320

241 cents and  $\frac{50}{100}$  of a cent is the interest for one year.

Then January, 1816 has 31 days, and in February we take 6 days, which make 37 days over a year. Then say 30 days are  $\frac{1}{2}$  of a year, 6 days  $\frac{1}{6}$  of 30, and 1 day  $\frac{1}{6}$  of 6 days.

In small business this method will be sufficiently exact, but in large sums it is advisable to calculate by the preceding rules, because 30 days fall short of  $\frac{1}{2}$  of a year.

*How to find the time a Note or Bond has been on Interest.*

**Lesson 17.**—Suppose a note was given on interest April 2, 1813, and paid March 4, 1816; how many years, months, and days does it draw interest?

Answer, 2 years, 11 months, and 2 days.

*Operation.*

March 4, 1816,

1816 years 2 m. 4 days.

April 2, 1813,

1813        3    2

Answer,        2        11        2

Allow 30 days to be one month, and 12 month one year.

*Observations.*

1. The Note was paid on the 4th of March, 1816, which time we call 1816, years on New-year's day last before the payment, and the 4th of March we say is 2 months and 4 days after New-year's day.

2. So again for the time of signing the note, we say that the 2nd of April was 3 months and 2 days after New-year's day 1813. Subtract and carry at 30 and at 12.

**Application.**—What is the interest of a Note of \$450.75 for 2 years 11 mo. and 2 days at 7 per cent. per annum?

Answer, \$92.20+

**Directions.**—First, find the interest for 3 years; then take one twelfth of one year's interest from that

sum, the difference will be 2 years 11 mo. interest. Secondly, take the 15th part of one month's interest for 2 days.

*Operation.*

45075 cents.

7 per cent.

---

3155.25 one year's interest.  
3 years the time.

---

9465.75 three years interest.  
262.93 one month's interest subtracted.

---

9202.82 two year's and 11 month's interest.  
17.528 two day's interest or 15th of one mo.

---

9220.348 Ans. \$92.20 cents, and .348 thousandths of a cent. +

**Lesson 18.**—If a Note were given on interest, 5th May, 1812, and paid March 2, 1817, what time should be allowed for interest?

Answer, 4 years, 9 mo. 27 days.

*Operation.*

March 2, 1817,	1817 years, 2 mo. 2 days.
May 5, 1812,	1812            4        5
	<hr/>
	... 4            9        27

**Application.**—What is the amount of \$16.50, for 4 years, 9 months and 27 days, at 7 per cent. per annum?

Answer, \$22.07+

**Observations.**—1. In this case obtain the interest for 4 years; then take half the interest for 1 year, and the half of that half for 9 months.

2. For 27 days divide the interest of 1 year by 12, the quotient will be the interest of 1 month, viz. 9.6250 cents; subtract one-tenth of a month's interest,



that is 3 days, from that sum, the remainder will be 27 day's interest, viz. 8.6625 cents.

*Operation.*

1650 cts. prin.	12)	115.50 cts 1 yr.
7 rate per ct.		<hr/>
	10)	9.6250 1 mo.
6 mo. $\frac{1}{2}$ a yr.)	115	.9625 3 days
	50	<hr/>
	int. for 1 yr.	
	4	
		8.6625 27 dys.

462	00	interest for 4 years.
3 mo. $\frac{1}{2}$ of 6)	57	75 interest for $\frac{1}{2}$ a year.
	28	875 interest for $\frac{1}{4}$ of a year.
	8	6625 interest for 27 days.
	<hr/>	
	557	2875 int. for 4 yrs. 9 mo. 27 days.
	1650	principal.
	<hr/>	
	2207	2875 amount, or answer.

**COMPOUND INTEREST.**

Find the interest of the given sum for 1 year, add that interest to the principal and call it the amount. Take this amount for the principal of the second year : Find the amount for the second year and make it the principal of the third year, &c. &c.

NOTE.—Subtract the given sum from the last amount, the remainder will be compound interest.

**DECIMAL INTEREST.**

Make a common multiplier for the rate per cent. thus : If 100 cents in one year give 7 cents interest, what will 1 cent give in the same time ?

	100	:	7	:	:	1
Principal,	1					cent.
	<hr/>					
	100	)	7.00			
			.07			

Here appears to be 7 hundredths of a cent for the interest of 1 cent 1 year: This .07 we will call a common multiplier, by which any number of cents may be multiplied, and the product will be their interest at 7 per cent. for 1 year.

For 6 per cent. .06 will be a common multiplier.

For 5 per cent. .05 ; for  $5\frac{1}{2}$ , .055, &c. They are all found by the rule of proportion as before.

**Lesson 18.**—What is the interest of 354 cents for 1 year at 7 per cent.?      Ans. 24.78 cents.

Principal,                      354 cents.  
Common multiplier,    .07

24.78

**Lesson 19.**—What is the interest of 13 dollars  $37\frac{1}{2}$  cents for 1 year, at 6 per cent.?      Ans. 60.25 cts.

Principal,                      1337.5 cts.  
Common multiplier,    .06

60.250 cts.

In the last lesson we point off three decimals in the product, because there are three in the factors, that is, one in the multiplicand, and two in the multiplier.

**LESSON 20.**

What is the interest of 316 dollars and 50 cents for 4 years at  $3\frac{1}{2}$  per cent per annum?      Ans. 44 dol. 31 cents.

Principal,                      31650 cts.  
Com. multiplier, .035

158250  
94950

one yr's int. 1107.750  
Numb. of yrs.              4

Ans.    4431.000 cts.    T

**LESSON 21.**

My agent has bought cattle to the amount of 3452 dollars  $87\frac{1}{2}$  cts.; how much will his commission be at the rate of two and a half per cent.?      Ans. 86 dol. 32 cents.

Principal,                      345287.5 cts.  
Com. mult.                      .025

17264375  
6905750

Ans.    8632.1875 cts.

**Lesson 22.**—What is the interest of £32 1s. 6d. for 5 years at  $6\frac{1}{2}$  per cent. per annum? Answer, £10 8s. 5d. 3q. 4 tenths.

A common multiplier is found in this case by the same proportion as that above Lesson 18, viz.

If 100 pounds in a year will give 6.5 pounds interest, what will one pound give in the same time?

Answer, .065 of a pound.\*

### COMPOUND INTEREST CALCULATED BY LOGARITHMS.

**Rule.**—Add the rate per cent. to 100; find the Logarithm of that sum, and subtract from it the Logarithm of 100; call the difference *Logratio*; multiply the Logratio by the number of years, and to that product add the Logarithm of the principal; the natural number of the last Logarithm will be the *amount* in Compound Interest.

**Example 1.**—What is the amount of \$500 for 3 years, at 7 per cent. per annum, compound interest?

Answer, \$612.50.

#### Operation.

Rate per cent.  $7+100=107$ . Log. of 107 is 2.02938  
Logarithm of 100 is 2.00000

Logratio or difference, 0.02938  
Number of years, Multiplier, 3

Product, 0.08814  
Principal 500. The Logarithm of which is 2.69897

Logarithm of the amount, 2.78711  
The natural number to 2.78711 is 612.5, the amount required.

\* This common multiplier can be on a memorandum, or retained in memory.

*Proof to Example 1.*

<b>\$500</b> principal.		
7 rate per cent.		
<hr/>		
35 00	interest for 1st y'r	\$572.45 principal 3d y'r
500	principal.	7 rate per cent.
<hr/>		
535	amount of 1st y'r.	40 07.15 interest 3d y'r.
\$535	principal 2d year.	572 45 principal.
7 rate per cent.		<hr/>
<hr/>		\$612 5215 amount.
37 45	interest 2d year.	
535	principal,	
<hr/>		
572 45	amount 2d year.	

**EXAMPLE 2.**

What is the compound interest of 6000 cents, for 4 years, at 5 per cent per annum?      Ans. \$12.93.

*Operation.*

Rate per cent. 5 + 100 = 105.	Logarithm	
of 105 is		2.02119
Logarithm of 100 is		2.00000
<hr/>		
Difference or Logratio,		0.02119
Number of years,	×	4
<hr/>		
Product,		0.08476
Principal 6000 ; Logarithm of which is		3.77815
<hr/>		

Natural number 7293 of the last Logarithm, 3.86291 .

This number 7293 cents, is the amount.

Subtract      6000 the principal.

**Leaves**      1293 cents for interest, or answer.

*Proof of Example 2.*

6000 cents principal. 5 rate per cent.		6615 cts. principal 3d y'r. 5 rate per cent.	
300 00	interest 1st year.	330 75	interest for 3d year
6000	principal.	6615	principal.
6300 00	amount for 1st year.	6945 75	amount for 3d. y'r.
6300	principal 2d year.	6945.75	cts. principal 4th
5	rate per cent.	5	rate per cent. [yr
315 00	interest for 2d y'r.	347 28.75	interest 4th y'r.
6300	principal.	6945 75	principal.
6615	amount for 2d year.	7293 0375	am't 4th year.
		6000	1st prin. to be
			[subtracted
		1293.0375	interest 4 years.

Logarithm Tables may be had at book-stores ; they are printed and bound like a pamphlet. They are also inserted in books on Surveying, Navigation, &c.

Mr. Chapman's patent sliding Interest Table, is an ingenious piece of work, and very convenient in computing simple interest.

**PRACTICE GENERALIZED;**

OR,

*The different cases in Practice wrought under one case.*

**RULE.**—Find the price of unity, or one, in the denomination next above the highest denomination in the given price; this will immediately give the price of the given number of integers; then take parts in the usual manner.

**EXAMPLES.**

*Lesson 1.*—1817 at 1*q.* Say, 1817 at 1*d.* the next nigher denomination; then divide by 12 and by 20, which operation will make £7 11*s.* 5*d.*; then divide that sum by 4, and the quotient will be the answer; because 1*q.* is the fourth of a penny.

For example, if 1817 apples at 1d. will amount to £7 11s. 5d., they will amount to one fourth of this sum at a farthing, viz. £1 17s. 10d. 1q.

OPERATION.

$$\begin{array}{r} 12 \overline{) 1817d.} \\ 20 \overline{) 151s. 5d.} \\ 4 \overline{) 7 \text{ 11s. 5d.}} \end{array}$$

$$\begin{array}{r} 20 \overline{) 151s. 5d.} \\ 4 \overline{) 7 \text{ 11s. 5d.}} \end{array}$$

$$\begin{array}{r} 4 \overline{) 7 \text{ 11s. 5d.}} \end{array}$$

$$\text{Ans. 1l. 17s. 10d. 1q.}$$

PROOF.

$$1q. \frac{1}{4} 1d. \overline{) 1817 \text{ at } 1q.}$$

$$12 \overline{) 454 \text{ 1q.}}$$

$$\div 20 \overline{) 37 \text{ 10d. 1q.}}$$

$$\text{Ans. 1l. 17s. 10d. 1q.}$$

LESSON 2.—1817 at 3 qrs. Here as in lesson first we say 1817d. which sum, divided by 12 and by 20 will make 7l. 11s. 5d. as before; then the half of this sum, and the half of that half, will be equal to the amount at 3q.; because 2q. are equal to half a penny, and 1q. is equal to half of 2q.

OPERATION.

$$\begin{array}{r} 12 \overline{) 1817d.} \\ 20 \overline{) 151s. 5d.} \end{array}$$

$$2q. \frac{1}{2} \text{ of } 1d. \overline{) 7l. 11 \text{ 5d.}}$$

$$1q. \frac{1}{2} \text{ of } 2q. \overline{) \begin{array}{r} 3 \text{ 15s. 8d. 2q.} \\ 1 \text{ 17 10 1} \end{array}}$$

$$\text{Answer, } \begin{array}{r} 5 \text{ 13 6 3} \end{array}$$

PROOF OLD WAY.

$$2q. \frac{1}{2} \text{ of } 1d. \overline{) 1817 \text{ at } 3q.}$$

$$1q. \frac{1}{2} \text{ of } 2q. \overline{) \begin{array}{r} 908d. 2q. \\ 454 \quad 1 \end{array}}$$

$$12 \overline{) 1362d. 3q.}$$

$$\div 20 \overline{) 113s. 6d. 3q.}$$

$$\text{Ans. 5l. 13s. 6d. 3q.}$$

LESSON 3.—1691 at 1d. 2q. In this lesson we say 1691 at 1s. makes 84l. 11s. Then 1d. is  $\frac{1}{12}$  of a shilling and 2q.  $\frac{1}{2}$  of a penny; that is, the  $\frac{1}{12}$  of 84l. 11s. and the half of that  $\frac{1}{12}$  will give the answer, viz. 10l. 11 4 2.

$$\text{Ans. 10l. 11s. 4d. 2q.}$$

LESSON 4.—1881 at 2s. 3d. 2q. Say 1881 at 20s. = 1881l. Then 2s. is  $\frac{1}{10}$  of a pound, 3d.  $\frac{1}{8}$  of 2s. and 2q.  $\frac{1}{4}$  of 3d.

$$\text{Ans. 215l. 10s. 7d. 2q.}$$

LESSON 5.—478 at 3s. 2d. 1q.

$$\text{Answer, } \begin{array}{r} 76l. 3s. 7d. 2q. \end{array}$$

LESSON 6 and 7.—What will 568 pairs of mittens come to at 2s. 6d. a pair, and at 3s. 4d. a pair?

$$\text{Ans. 71l. at 2s. 6d. and 94l. 13s. 4d. at 3s. 4d.}$$

EXPLANATION.—In the first place we consider 568 pairs at 20s. equal to 568l. Then as 2s. 6d. is  $\frac{1}{8}$  of a pound, we divide by 8, the quotient is the answer at 2s. 6d.

Secondly, we say 3s. 4d. is  $\frac{1}{4}$  of a pound, and divide by 4, the quotient will be the answer at 3s. 4d.

T\*

## OPERATION.

2s. 6d.  $\frac{1}{2}$  of 1l. | 568 at 2s. 6d. || 3s. 4d.  $\frac{1}{2}$  of 1l. | 568 at 3s. 4d.  
 Ans. 71l. || Ans. 94l. 13s. 4d.

LESSON 8 and 9.—678 at 5s. and 6s. 8d.

## OPERATIONS.

5s.  $\frac{1}{4}$  of 1l. | 678 at 5s.      6s. 8d.  $\frac{1}{2}$  of 1l. | 678 at 6s. 8d.  
 Ans. 169l. 10s.      Ans. 226l.

LESSON 10.—678 at 7s. 6d. 2q.

## DIRECTIONS.

Say 678 at 20s. equal 678l. Then take parts of that sum thus: 4s. equal  $\frac{1}{2}$  of a pound; 2s. equal  $\frac{1}{2}$  of 4s.; 1s. equal  $\frac{1}{2}$  of 2s.; 6d. equal  $\frac{1}{2}$  of 1s., and 2q. equal  $\frac{1}{2}$  of 6d.

## OPERATION.

4s.  $\frac{1}{2}$  of 1l. | 678l. at 7s. 6d. 2q.

2s.  $\frac{1}{2}$  of 4s. | 135 12s.

1s.  $\frac{1}{2}$  of 2s. | 67 16s.

6d.  $\frac{1}{2}$  of 1s. | 33 18s.

2q.  $\frac{1}{2}$  of 6d. | 16 19s.

- 1 8s. 3d.

Answer, 255l. 13s. 3d.

## PROOF.

6d.  $\frac{1}{2}$  of 1s. | 678  
 7

4746s.

2q.  $\frac{1}{2}$  of 6d. | 339s.

28s. 3d

÷ 20 | 5113s. 3d.

Answer, 255l. 13s. 3d.

LESSON 11.—459 at 15s. 8d. 3q.

Here we will suppose that 459 cost 459l. Then say, 10s. equal  $\frac{1}{2}$  of a pound; 5s. equal  $\frac{1}{2}$  of 10s.; 6d. equal  $\frac{1}{10}$  of 5s.; 2d. equal  $\frac{1}{2}$  of 6d.; 2q. equal  $\frac{1}{2}$  of 2d., and 1q. equal  $\frac{1}{2}$  of 2q.

## OPERATION.

10s.  $\frac{1}{2}$  of 1l. | 459 at 15s. 8d. 3q.

5s.  $\frac{1}{2}$  of 10s. | 229 10s.

6d.  $\frac{1}{10}$  of 5s. | 114 15s.

2d.  $\frac{1}{2}$  of 6d. | 11 9s. 6d.

2q.  $\frac{1}{2}$  of 2d. | 3 16s. 6d.

1q.  $\frac{1}{2}$  of 2q. | 0 19s. 1d. 2q.

9s. 6d. 3q.

Answer, 360l. 19s. 8d. 1q.

## PROOF.

6d.  $\frac{1}{2}$  of 1s. | 459  
 × 3

1377

× 5

6885s.

2d.  $\frac{1}{2}$  of 6d. | 229s. 6d.

2q.  $\frac{1}{2}$  of 2d. | 76s. 6d.

1q.  $\frac{1}{2}$  of 2q. | 19s. 1d. 2q.

9s. 6d. 3q.

÷ 20 | 7219s. 8d. 1q.

Answer, 360l. 19s. 8d. 1q.

## LESSON 12.—642 at 37s. 6d 2q.

## STATEMENT.

Say 642 pounds; this will include the amount of the integers at 20s. each: then for 17s. 6d. 2q. say 10s. equal  $\frac{1}{2}$  of a pound; 5s. equals the half of 10s.; 2s. 6d. equals the half 5s. and 2q. equals  $\frac{1}{80}$  of 2s. 6d.

## OPERATION.

$$\begin{array}{r}
 10s. \quad \frac{1}{2} \text{ of } 1l. \quad | 642l. \\
 5s. \quad \frac{1}{2} \text{ of } 10s. \quad | 321 \\
 2s. \ 6d. \quad \frac{1}{2} \text{ of } 5s. \quad | 160 \ 10s. \\
 2q. \quad \frac{1}{80} \text{ of } 2s. \ 6d. \quad | 80 \ 5s. \\
 \qquad \qquad \qquad \qquad \qquad \qquad 1 \ 6s. \ 9d. \\
 \hline
 \end{array}$$

Answer, 1205l. 1s. 9d.

## PROOF.

$$\begin{array}{r}
 6d. \ \frac{1}{2} \text{ of } 1s. \quad | 642 \\
 \times \quad \quad \quad | 37 \ s. \\
 \hline
 4494 \\
 1926 \\
 \hline
 23754s. \\
 2q. \ \frac{1}{12} \text{ of } 6d. \quad | 321s. \\
 \qquad \qquad \qquad \qquad \qquad \qquad 26s. \ 9d. \\
 \hline
 \end{array}$$

$$\div 20 | 24101s. \ 9d.$$

Answer, 1205l. 1s. 9d.

LESSON 13.—What cost 15 tons 9 cwt. 3 qrs. 25 lb. of iron, at 2l. 16s. a hundred? Ans. 867l. 18s. 6d.

DIRECTIONS. 1. Multiply the price of 100 cwt. by 20, the product will be the price of 1 ton.

2. Multiply the price of 1 ton by 15, the product will be the price of 15 tons.

3. Multiply the price of 1 cwt. by 9, the product will be the price of 9 cwt.

4. For the 3 qrs. 25 lb. say, 2 qrs. equal  $\frac{1}{2}$  of 1 cwt.; 1 qr. equals  $\frac{1}{2}$  of 2 qrs.; 14 lb. equal  $\frac{1}{2}$  of 1 qr.; 7 lb. equal  $\frac{1}{2}$  of 14 lb.; and 4 lb. equal  $\frac{1}{8}$  part of 1 cwt.

Answer, 867 18 6.

Proof in dollars and cents, at the rate of 8s. to the dollar.

$$\begin{array}{r}
 2 \text{ qrs. } \frac{1}{2} \text{ of } 1 \text{ cwt.} \quad | \$7. \quad \text{price of } 1 \text{ cwt.} \\
 \qquad \qquad \qquad \qquad \qquad \qquad 20 \quad \text{cwt. } 1 \text{ ton.} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 140 \quad \text{price of } 1 \text{ ton.} \\
 5 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 700 \\
 3 \\
 \hline
 \end{array}$$

2100 price of 15 tons. Continued.



$\$7 \times 9 =$	2100, price of 15 tons.
1 qr. $\frac{1}{2}$ of 2 qrs.	63 price of 9 cwt
14lb. $\frac{1}{2}$ of 1 qr.	3.50 price of 2 qrs.
7lb. $\frac{1}{2}$ of 14lb.	1.75
	.875
	.4375
4lb. $= \frac{1}{2}$ of 1 cwt.	.2500

$\$2169.8125$  Answer,  $\$2169.81\frac{1}{2}$  cts.

## EXTRACTION OF THE SQUARE ROOT.

A *square* is the product of a number multiplied by itself; as, 4 mul. by 4 equals 16; here 16 is the square of 4: This is called *Involution*; and when this sign is inserted  $\sqrt{\quad}$  it signifies, the square of any number is required, as,  $\sqrt{4}$ , is as much as to say, "multiply 4 by itself," or, "the square of 4."

The *Square Root* is a number extracted, which being multiplied by itself will produce the given number it was extracted from; as, the square root of 16 equals 4; and this root 4 multiplied by itself, will produce its resolvend or dividend 16. Extraction of Roots is called *Evolution*; and when the square root of any number is required, it may be signified by this mark placed before the number thus,  $\sqrt{16}$ ; that is to say, "the square root of 16."

### A TABLE OF ROOTS AND SQUARES.

Roots,	1	2	3	4	5	6	7	8	9
Squares,	1	4	9	16	25	36	49	64	81

The dividend is commonly called the Resolvend.

The quotient is the Root.

That root which can be found to exactness, is a *rational* root. That root which cannot be found to exactness is a *surd*.

When odd places are given in the decimals, make them even by annexing ciphers.

When a root proves to be a *surd*, annex ciphers by

pairs, till the fraction is reduced to a sufficient degree of minuteness.

When preparing the dividend for extraction, begin with the integers at units and count two figures to the left, there make a distinction; then count two more, and continue this operation till the whole numbers are marked into pairs. Begin again with the decimals, and proceed to the right marking them also into pairs.

## EXAMPLES.

*Lesson 1.*—What is the square root of 62750.25 ?

Point off the work thus,  $\begin{cases} a & b & c & d \\ 6, & 27, & 50. & 25, \end{cases}$

$$\begin{array}{r} \begin{array}{cccc} a & b & c & d \end{array} \text{ root} \\ \sqrt{6, 27, 50. 25, (250. 5} \\ 4 \\ e \text{ ---} \\ 45(227 \\ 225 \\ f \text{ ---} \\ 5005) .25025 \\ 25025 \end{array}$$

Point off as many decimals in the quotient or root, as there are pairs in the fractions.

In this case there is one pair in the decimals, therefore we point off one figure in the root for decimals.

*Operation with words.*—First seek the root of 6; it must be 2; place 2 under *r* in the quotient; multiply it by itself; set its square 4 under 6; subtract, the remainder is 2.

Second: Bring down 27 from under *b* to to the right of 2, makes 227 for a new dividend: multiply the quotient by 2 makes 4; place this 4 for a divisor as at 4 under *e*. Seek how many times 4 in the dividend, excepting always the right hand figure; say 5 times; place 5 on the right side of 4, for a new divisor, also place 5 in the quotient as under *o*; then multiply as in Long Division, and place the product 225 under 227; subtract, the remainder is 2.

**Third:** Bring down the pair 50 from under *c* to the right side of 2, makes 250; double the quotient and place the product as at 50 under *f*, for a divisor; seek how many times 50 in 250, rejecting the right hand figure in the dividend; set no times or cipher in the quotient on the right side of 5 under *o*, and place a cipher also in the divisor at the right hand of 50 under *f*, which cipher will make the divisor 500.

**Fourth;** Bring down the pair 25 from under *d*, to right side of 250, makes 25025 for a new dividend; seek how many times 500 in 25025, rejecting the right hand 5 in the dividend; say 5 times; set 5 on the right hand of the divisor 500 under *f*, makes 5005 for a new divisor, and place 5 under *t*, multiply the divisor by the quotient figure, as in Long Division, and place the product under 25025. The root or answer is 250.5.

*Proof of Lesson 1.*

**Rule.**—Multiply the root by itself, the product will be the same as the resolvend or dividend.

— 250.5	<b>Lesson 2.</b> —What is the square root of 21377.071681?
250.5	2,13,77.07,16,81(146.209
—	1
12525	g. ——— Ans. 146.209
125250	24)113
5010	96
—	h. ———
Proof, 62750.25	256)1777
	1716
	i. ———
	2922)6107
	5844
	k. ———
	292409).2631681
	2631681
	—

**Operation with words.**—First: Seek the root up to

the first comma; the root of 2 is 1: place 1 in the quotient and 1 under the first figure 2; subtract, the remainder is one.

Second: Bring down the pair 13 to the right side of 1, makes 113 for a new dividend; double the quotient figure 1 and place the product for a divisor as at 2 under *g*, seek how many times 2 in the new dividend 113, rejecting the right hand figure 3; say 4 times; set 4 in the quotient; set 4 also on the right of 2 under *g*, makes 24 for a new divisor; multiply this divisor by the last figure 4 in the quotient; set the product 96 under 113; subtract, the remainder is 17.

Third: Bring down the pair 77 to the right side of 17, makes 1777 for a new dividend; double the 14 in the quotient makes 28; place 28 for a divisor as under *h*, seek how many times 28 in 1777, rejecting the right hand 7; say 6 times; set 6 in the quotient at the right side of 14; and place 6 also on the right of the divisor 28, which makes 286 for a new divisor; multiply as in Long Division, and place the product under 1777; subtract; the remainder is 61.

Fourth: Bring down the pair 07 to the right side of 61, makes 6107 for a new dividend; double the 3 figures in the quotient; set their product for a divisor as at 292 under *i*, seek how many times 292 in 6107; say 2 times; place 2 in the quotient on the right of 6; place 2 also on the right of 292, makes 2922 for a new divisor; multiply as in Long Division, and place the product under 6107; subtract, the remainder is 263.

Fifth: Bring down the pair 16 to the right side of 263, makes 26316; double the four figures in the quotient and set their product for a divisor as at 2924 under *k*; seek how many times 2924 in 26316, rejecting the right hand 6; say no times; set a cipher in the quotient and another on the right of 2924, makes 29240.

Sixth: Bring down the pair 81 to the right side of 26316, makes 2631681 for a new dividend; seek how

many times 29240 are in the dividend, rejecting the right hand figure 1; say 9 times; set 9 in the quotient and at the right of the cipher in the divisor, makes 292409; multiply as in Long Division and set the product under 2631681.

Now because there were 3 pairs in the decimals we will point off three decimals in the root: This gives for the root, 146.209; which if multiplied by itself, will produce the number it was extracted from, 21377.071681.

**Lesson 3.**—What is the square root of .75?

$  \begin{array}{r}  \sqrt{.75,00,00(.866} \\  \underline{64} \\  166)1100 \\  \underline{996} \\  1726)10400 \\  \underline{10356} \\  \text{Rem. } 44 \\  \text{Surds are marked with} \\  \text{the sign } + \text{ more.}  \end{array}  $		<p style="text-align: right;">Answer, .866 +</p> <p><i>Proof of Lesson 3.</i></p> $  \begin{array}{r}  \sqrt{.75} \text{ the Root } .866 \\  \underline{.866} \\  5196 \\  \underline{5196} \\  6928 \\  \underline{6928} \\  .749956 \\  \text{Remainder added, } 44 \\  \underline{.750000}  \end{array}  $
---	--	---

**Lesson 4.**—If any army consist of 222784 men, how many will each side contain when they are placed in form of a solid square?

Answer, 472.

$$\sqrt{22,27,84.}(472$$

16

$$87).627$$

609

$$942).1884$$

1884

**Lesson 5.**—How large a square room may I floor with 5625 feet of plank?

Ans. 75 feet square.

✓ 56,25(75 root or answer.  
49

145).725  
725

**Lesson 6.**—An irregular field of corn contains 197136 hills; how many hills must be placed in a row when the whole are formed into a square field?

Answer, 444

✓ 19,71,36)144 root or answer.  
16

64).371  
336

884).3536  
3536

**Lesson 7.**—How long is the diagonal line of a field in form of a parallelogram, 10 chains one way and 5 the other? Ans. 1118 links + or 11 ch. 18 links+

**Note 1.** A diagonal line is a line drawn from corner to corner, of any square figure.

2. A parallelogram is an oblong or long square.

3. A right angle or corner contains 90 degrees, and is in the shape of a carpenter's square.

4. An angle greater than 90 degrees, is an *obtuse* angle, that is, dull, blunt, not sharp pointed.

5. An angle less than 90 degrees, is an *acute* angle, that is, a corner sharp pointed.

**Lesson 8.**—The wall of a fort is 24 feet in height, and a ditch of 12 feet wide surrounds the fort; I wish to know the length of a ladder that will reach from the outer edge of the ditch to the top of the wall?

Ans. 26.83+feet.

**Lesson 9.**—A steeple 120 feet in height has a ladder of the same length placed with the foot 20 feet

from the bottom of the steeple, on a level surface; how far does the top of the ladder come below the top of the steeple?    Ans. 1 foot 8 in. 1" 11'" +

*Lesson 10.*—Let 6400 men be formed in solid column, with 4 times as many in file as in rank; how will they stand?    Ans. 40 in rank and 160 in file.

*Rule.*—The Square Root of one fourth of the men will give the number in rank; and the number in rank multiplied by the ratio 4, will give the number in file.

*Lesson 11.*—Let 17298 men be so formed that the number in rank will be double the number in file.

Answer, 186 in rank and 93 in file.

*Mode of Operation.*

$$17298 \div 2 = 8649. \quad \sqrt{8649} = 93 \text{ in file.}$$

$$93 \text{ in file} \times 2 = 186 \text{ in rank.}$$

### RATE-BILL.

If the value of the real and personal estates, in any city or town, be rated at 34562 dollars, and a tax of 565 dollars be imposed thereon, it is required to ascertain how much that will be on a dollar?

Answer, .01634743 +

*Proportional statement and operation.*

$$34562 : 565.00000000 :: 1$$

$$34562)565.00000000(.01634743 + \text{quotient,}$$

34562

---

219380

20773 2

---

, 120080

103686

---

. 163940 continued.

```

: 163940
138248
-----
: 256920
241934
-----
: 149860
138248
-----
: 116120
103686
-----
: 12434
    
```

# DIRECTIONS:

1. Find how much this tax will be on a dollar, by making a statement in Proportion as above; by that we find it will be .01634743 of a dollar; but in order to make the result great enough to prove the work after calculating several different shares, we will alter the last figure 3 in the decimal number .01634743 and make it a 4. This method will cause us to gain a small fraction rather than to lose.

2. Multiply this decimal number, or common multiplier, or ratio if you please, by 2, by 3, by 4, by 5, by 6, by 7, by 8, by 9, and by 10. Place these products under each other for a scale, which will enable us to calculate any number or share by inspection.

## Operation and Example.

No.	1	.0	1	6	3	4	7	4	4
Multiply	2	.0	3	2	6	9	4	8	8
do.	3	.0	4	9	0	4	2	3	2
do.	4	.0	6	5	3	8	9	7	6
do.	5	.0	8	1	7	3	7	2	0
do.	6	.0	9	8	0	8	4	6	4
do.	7	.1	1	4	4	3	2	0	8
do.	8	.1	3	0	7	7	9	5	2
do.	9	.1	4	7	1	2	6	9	6
do.	10	.1	6	3	4	7	4	4	0



Now to elucidate this scale we will take .01634744 for the tax on one dollar ; .03269488 for the tax on two dollars ; .04904232 for the tax on three dollars ; .06538976 for the tax on four dollars ; .08173720 for the tax on five dollars ; .09806464 for the tax on six dollars ; .11443208 for the tax on seven dollars ; .13077952 for the tax on eight dollars ; .14712696 for the tax on nine dollars, and .16347440 for the tax on ten dollars.

3. When we want to know the tax on 20, move the decimal point of No. 2, one figure to the right, thus, 0.3269488 ; on 30, move the decimal point of No. 3, one figure to the right, thus, 0.4904232 ; on 40, move the decimal point of No. 4, one figure to the right, thus, 0.6538976 ; &c. to ten.

4. For the tax on 100, move the decimal point of No. 1, two figures to the right, thus, 01.634744 ; or, move the point of 10 one figure to the right thus, 1.6347440 ; for the tax on 200 dollars, move the decimal point of No. 2, two figures to the right, thus, 03.269488 ; for the tax on 300 dollars, move the decimal point of No. 3, two figures to the right, thus, 04.904232 ; and proceed down with all the numbers in the same manner as the case may require. But, mind when coming to ten, that the moving of two figures to the right will make ten hundred, that is, 1000. This number 10 must be taken notice of particularly, or some great error may arise in calculation.

It may be remarked also, that, whoever undertakes to apportion assessments by this scale, ought to be, previously, acquainted with decimals : But, let us proceed.

5. If we want to know the tax on 1000 dollars, move the decimal point of No. 1, three figures to the right, thus, 016.34744 ;\* on 2000 dollars, move the point of No. 2, three figures to the right, thus, 032.-

\* This same tax may be taken from No. 10, by moving the decimal point only two figures to the right as before mentioned ; because 1 is already multiplied by 10, and ten multiplied by 100 = 1000.

89488; on 8000, move the decimal point of No. 8, three figures to the right, thus, 130.77952; and so for the rest of the numbers as occasion may require.

6. When the number of dollars to be taxed consists of tens, hundreds, thousands, or tens of thousands, as, 13440 the value of A's estate, hereafter mentioned, begin A's tax with ten thousand by inspecting the scale and moving the decimal point of No. 1, four figures to the right; or you may for the same tax move the point of No. 10, three figures to the right; then the tax on ten thousand dollars will be 0163.4744 or, 163.4744 the same in value.

7. Set 0163.4744 in a memorandum,

thus,

0163.4744

Then find the tax on three thousand	b. 049.04232
and by inspecting the scale at N. 3,	c. 06.538976
and moving the decimal point three	d. 0.6538976
figures to the right and place your	
work in the memorandum as at b.	e. 219.7095936

Then look at the scale for four hundred, and move the point of No. 4, two figures to the right, and place it in the memorandum as at c.

8. Now we want the tax on 40 dollars: look at No. 4, and move the point one figure to the right, and place it in the memorandum as at d.

Add these several sums in the memorandum for A's share of the tax, which will be \$219.7095936 as at e, over A.

9. Now we will suppose that four men, A, B, C, and D, must raise the whole tax of 565 dollars: that the estate of A is worth 13440 dollars as before mentioned, that of B, 8651, that of C, 10452, and that of D, 2019 dollars; which several sums added together, produce a sum equal to that of their real and personal estates, viz. 34562 dollars.

10. In the next place find B's part of the tax: 8651 dollars is the amount of his estate; inspect the scale at No. 8, for 8000 dollars and move the decimal point three figures to the right thus, 130.77952; place

# SELF TEACHER.

number in a memorandum as in the case of A,  
 s, 130.77952;  
 u for 600, inspect No. 6, and f. 09.808464  
 ve the point two figures to the g. 0.8173720  
 ght as at f; for 50 move the point h. .01634744  
 i No. 5, one figure to the right as  
 t g; and for 1, insert No. 1, as j. \$141.42170344  
 at h. B.

Thus we find B's share of the tax to be \$141.42170344 as at j, over P.

11. C's estate is 10452 dollars. Inspect the scale at No. 1, and move the point four figures to the right thus, 0163.4744;

for 400, two figures No. 4, thus, 06.536976;  
 for 50, 1 figure to the right of No. 5, thus 0.8173720;  
 for 2 insert No. 2, thus, .03269438;

Thus the share of C is \$170.86344288  
 C.

12. D's estate is 2019 dollars :

Move the point at No. 2. three figures to the right for 2000 dollars, thus, 032.69488;  
 for 10 dollars, copy No. 10. thus, .16347440;  
 for 9 dollars, copy No. 9. thus, .14712696;

D's share of the tax is,	\$33.00548136
C's,	170.86344288
B's,	141.42170344
A's,	219.7095936

Proof, \$565.00022128

If we wish to know how much the tax would be on a cent or cents, move the decimal point two figures to the left by prefixing ciphers which is the same as dividing by 100.

## EXAMPLES.

For the tax on one cent, prefix two ciphers to No.

1. thus, .00016347+; for two cents prefix two ciphers to No. 2. thus, .00032694+; for three cents prefix two ciphers to No. 3. thus, .00049042+; and so on for the residue of the scale.

### ALLIGATION.

This rule is divided into two parts, *Alligation Medial* and *Alligation Alternate*. It signifies a linking together; it enables us to find the value or mean rate of a pound, an ounce, a bushel, a gallon, &c. of any mixture when several sorts are combined at different prices. And to the contrary, we find the several quantities to be mixed, when their prices or rates are given.

### ALLIGATION MEDIAL.

*Rule.*—As the *sum total* of the different articles, is to the *amount* of their combined value;  
So is any *particular part* of the whole mixture, to its *particular value*.

### EXAMPLE 1.

Suppose we mix 4 bushels of pease at \$1. a bushel with 6 bushels of oats at 50 cents a bushel, 2 bushels of rye at \$1.25 a bushel, 3 bushels of corn at 75 cents a bushel, and 8 bushels of buckwheat at 40 cents a bushel; what will a bushel of this mixture be worth?

Answer, 65 cents.

### Operation.

4 bushels	of peas,	at	100 cents	=	400 cents
6 do.	of oats,	at	50	=	300
2 do.	of rye,	at	125	=	250
3 do.	of corn,	at	75	=	225
8 do.	of buckwheat,	at	40	=	320

---

23 bushels || Amount of their combined value 1495 cents;  
make the sum ||  
total of the dif- ||  
ferent articles. ||

Now say, as 23 articles, or bushels, 23 : 1495 :: 1  
 are to 1495 cents combined value ; 23)1495(65 cents  
 So is 1 bushel, 138  
 to its particular value.

138

.115

115

Or,  
 Say, as 23 articles,  
 are to 1 article ;  
 So are 1495 cents,  
 to 65 cents the answer.

A. A. Cents.

23 : 1 :: 1495

÷23)1495(65 cents.

138

.115

115

## EXAMPLE 2.

Mix 5 gallons of Wine at \$2. a gallon, with 8 gallons at \$2.50 a gallon, 10 gallons at \$3. a gallon, and 7 gallons at \$4. a gallon ; at what price can a grocer afford to sell this mixture by the gallon?

Answer, \$2.93 and .33+ of a cent.

*Operation.*

5	gallons of Wine	at 200 cents	=	1000 cents.
8	do.	at 250	=	2000
1	do.	at 300	=	3000
7	do.	at 400	=	2800

30 Sum total of the different articles. 8800 Amount of  
 their combined value.

As 30 articles, or gallons, g. cents. g.  
 are to 8800 cents combined 30 : 8800 :: 1

So is 1 gallon, [value. 30)8800(293.33+  
 to its particular value. 60

280

270

.100

90

100\* conti'd

100\*

90

100\*

90

10

\* A star or asterisk used in this manner, denotes the addition of decimal ciphers as has been noted before.

### ALLIGATION ALTERNATE,

Operates to the reverse of Alligation Medial, because the rate and prices are given to find the quantities to be mixed.

*Rule.*—1. Place the *prices* of the *simples* in a column, beginning with the least uppermost, increasing with the next least, till you come to the foot of the column with the greatest.

2. Place the *given rate* or *mean price* on the left of the column.

3. Connect, with a circular line, the price of a simple, which is *less* than the mean rate, with one which is *greater* than the mean rate; and so to the contrary, a *greater* with a *lesser*.

4. Take the difference between the mean rate and each simple, and place to the right, opposite to that other simple with which it is connected.

5. Carry out to the right, in a column, the amount of that difference, at the price which stands opposite in the first column.

### EXAMPLE 1.

A Tobacconist has four sorts of tobacco; one at 10 cents, another at 20 cents, a third at 30 cents, and a fourth at 40 cents a pound; he wishes to know what quantity of each may be mixed, so that he can afford to sell at 25 cents a pound?

Here we will call 25 cents, the given or mean rate, and 10, 20, 30, 40, prices of the simples.

*Operation.*

25 cents.	{	10—	cents, 15 lb. at 10 cents, =	150 cents.
		20)	5 do. at 20	= 100
		30)	5 do. at 30	= 150
		40—	15 do. at 40	= 600

Mean rate, Multiply 40 No. of lbs. \$10.00 Am't.  
 25 mean rate. [of the simples.

Proof, \$10.00

The answer is 15 lb. at 10 cents, 5 lb. at 20 cents, 5 lb. at 30 cents, and 15 lb. at 40 cents.

**EXAMPLE 2:**

Sugar at 10 cents a pound, at 20 cents, at 30 cents and at 40 cents, being ready for a mixture, required how many pounds of each to make a composition worth 25 cents a pound?

Answer, 5lb at 10 cents, 15lb at 20, 15lb at 30, and 5lb at 40.

*Simples.*

*Operation.*

Mean rate 25.	{	10—	5 lb. at 10 cts. =	50
		20)	15 lb. at 20	= 300
		30)	15 lb. at 30	= 450
		40—	5 lb. at 40	= 200

Am't of articles or simples 40 lb. \$10.00  
 amount of the simples.

*Proof by Alligation Medial.*

lb. cts. lb. { If 40 lb. simples cost 10 dol-  
 ÷ 40 : 1000 :: 1 { lars, what will 1 lb. cost?  
 80 (25 lb. answer.

200  
 200  
 —

**EXAMPLE 3.**

A farmer mixing oats at 40 cents a bushel, with peas at 75 cents a bushel, and corn at 100 cents a

bushel, required how much of each sort to make a mixture worth 70 cents a bushel?

Answer, 35 bushels at 40 cents, 30 at 75 cents, and 30 at 100 cents.

*Operation.*

$$\begin{array}{rcl}
 70 \left\{ \begin{array}{l} 40- \\ 75) \\ 100- \end{array} \right\} & 5 + 30 = 35 & \text{at } 40 \text{ c.} = 1400 \text{ c.} \\
 & & 30 \text{ at } 75 \text{ c.} = 2250 \text{ c.} \\
 & & 30 \text{ at } 100 \text{ c.} = 3000 \text{ c.} \\
 & & \hline
 \end{array}$$

No. of bushels or simples, 95 6650 c. ]  
amount of simples.

*Proof.*—As 95 bushels, or simples, are to 6650 cents; so is 1 bushel to its value.

$$\div 95 : 6650 :: 1$$

665 (70 answer in cents.)

...0

**NOTE.**—When more differences than one happen against any simple, as at 40, then such differences must be added together, as  $5 + 30 = 35$ .

Many and various operations may be wrought in Alligation Alternate, and Alternation Total; but these examples must suffice for an introduction.—More useful matter claims a preference, and the want of room forbids the insertion of several curious subjects.

END OF PART EIGHTH



# INTRODUCTION TO ARITHMETIC.

## PART IX.

CONTAINING  
THE CARDS.



CARD No. 6.  
SIMPLE ADDITION.

<i>Lesson 1.</i> Page 22.	<i>2nd.</i> Page 23.	<i>3rd.</i> Page 23.
22 Apples.	34 Peaches.	152 Pears.
34	41	343
21	52	444
33	35	561
12	24	324
23	34	444
—	—	—
<i>Lesson 4th.</i> Page 24.	<i>5th.</i> Page 24.	<i>6th.</i> Page 25.
461	564	1562
352	456	2446
433	352	3125
502	463	4563
434	624	2344
346	102	4653
—	—	—
<i>Lesson 7th.</i> Page 25.	<i>8th.</i> Page 26.	<i>9th.</i> Page 26.
3470	6410	7420
2665	7527	302
4670	4060	5008
3760	5007	710
0040	7010	4500
4000	2200	3300
—	—	—

## SIMPLE SUBTRACTION.

*Lesson 1st.***Page 31.**

2468

1345

*2nd.***Page 32.**

45621

35242

*3rd.***Page 32.**

582137

216232

*Lesson 4th.***Page 32.**

456821

324912

*5th.***Page 33.**

601021

8970

*6th.***Page 33.**

821903

12461

*Lesson 7th.***Page 33.**

781210

521621

*8th.***Page 34.**

641315

426436

*9th.***Page 34.**

456781

326879

*Lesson 10th.***Page 35.**

642137

472318

*11th.***Page 36.**

460210

340012

*12th.***Page 36.**

900000

426436

*Lesson 13th.***Page 37.**

54321

18765

*14th.***Page 37.**

628134

419243

*15th.***Page 37.**

644310

421536

CARD No. 7.

## NUMERATION TABLE.

See page 41.

Units;

Units, Tens;

Units, Tens, Hundreds;

Units, Tens, Hundreds, Thousands;

Units Tens, Hundreds, Thousands, Tens of Thousands;

W

Units, Tens, Hundreds, Thousands, Tens of Thousands, Hundreds of Thousands;

Units, Tens, Hundreds, Thousands, Tens of Thousands, 100 of Thousands, Millions;

Units, Tens, Hundreds, Thousands, Tens of Thousands; 100 of Thousands, Millions, Tens of Millions;

Units, Tens, Hundreds, Thousands, Tens of Thousands, Hundreds of Thousands, Millions, Tens, of Millions, Hundreds of Millions.

### NUMERATION TABLE, No. 1.

See page 41.

One:	1
Twelve:	12
One Hundred and Twenty-three:	123
One Thousand, 234:	1,234
Twelve Thousand, 345:	12,345
123 Thousand, 456:	,123,456
One Million, 234 Thousand, 567:	1,234,567
Twelve Million, 345 Thousand, Six Hundred and 78:	} 12,345,678
One Hundred and 23 Million, 456 Thousand, 789:	
	,123,456,789

## NUMERATION TABLE NO. 2.

† This table is inserted for scholars to look at occasionally after they have studied that on Card No. 7. But, as these high numbers are of but little use, students may employ themselves in contemplating on subjects of greater importance.

QUADRILLIONS, Hundreds of thousands of trillions, Tens of thousands of trillions, Thousands of trillions, Hundreds of trillions, Tens of trillions, TRILLIONS,	Hundreds of thousands of billions, Tens of thousands of billions, Thousands of billions, Hundreds of billions, Tens of Billions, BILLIONS,	Hundreds of thousands of millions, Tens of thousands of millions, Thousands of millions, Hundreds of millions, Tens of Millions, MILLIONS,	Hundreds of thousands, Tens of thousands, Thousands, Hundreds, Tens, UNITS.	
			1	1
			10	2
			100	3
			1,000	4
			10,000	5
			100,000	6
			1,000,000	7
			10,000,000	8
			100,000,000	9
			1,000,000,000	10
			10,000,000,000	11
			100,000,000,000	12
			1,000,000,000,000	13
			10,000,000,000,000	14
			100,000,000,000,000	15
			1,000,000,000,000,000	16
			10,000,000,000,000,000	17
			100,000,000,000,000,000	18
			1,000,000,000,000,000,000	19
			10,000,000,000,000,000,000	20
			100,000,000,000,000,000,000	21
			1,000,000,000,000,000,000,000	22
			10,000,000,000,000,000,000,000	23
			100,000,000,000,000,000,000,000	24
			1,000,000,000,000,000,000,000,000	25
			10,000,000,000,000,000,000,000,000	26
			100,000,000,000,000,000,000,000,000	27
			1,000,000,000,000,000,000,000,000,000	28
			10,000,000,000,000,000,000,000,000,000	29
			100,000,000,000,000,000,000,000,000,000	30
			1,000,000,000,000,000,000,000,000,000,000	31
			10,000,000,000,000,000,000,000,000,000,000	32
			100,000,000,000,000,000,000,000,000,000,000	33
			1,000,000,000,000,000,000,000,000,000,000,000	34
			10,000,000,000,000,000,000,000,000,000,000,000	35
			100,000,000,000,000,000,000,000,000,000,000,000	36
			1,000,000,000,000,000,000,000,000,000,000,000,000	37
			10,000,000,000,000,000,000,000,000,000,000,000,000	38
			100,000,000,000,000,000,000,000,000,000,000,000,000	39
			1,000,000,000,000,000,000,000,000,000,000,000,000,000	40
			10,000,000,000,000,000,000,000,000,000,000,000,000,000	41
			100,000,000,000,000,000,000,000,000,000,000,000,000,000	42
			1,000,000,000,000,000,000,000,000,000,000,000,000,000,000	43
			10,000,000,000,000,000,000,000,000,000,000,000,000,000,000	44
			100,000,000,000,000,000,000,000,000,000,000,000,000,000,000	45
			1,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	46
			10,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	47
			100,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	48
			1,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	49
			10,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	50
			100,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	51
			1,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	52
			10,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	53
			100,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	54
			1,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	55
			10,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	56
			100,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	57
			1,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	58
			10,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	59
			100,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000	60
			1,000	61
			10,000	62
			100,000	63
			1,000	64
			10,000	65
			100,000	66
			1,000	67
			10,000	68
			100,000	69
			1,000	70
			10,000	71
			100,000	72
			1,000	73
			10,000	74
			100,000	75
			1,000	76
			10,000	77
			100,000	78
			1,000	79
			10,000	80
			100,000	81
			1,000	82
			10,000	83
			100,000	84
			1,000	85
			10,000	86
			100,000	87
			1,000	88
			10,000	89
			100,000	90
			1,000	91
			10,000	92
			100,000	93
			1,000	94
			10,000	95
			100,000	96
			1,000	97
			10,000	98
			100,000	99
			1,000	100

In the *first* place say one ; in the *second* ten ; in the *third* one hundred and one ; in the *fourth* one thousand and ten ; in the *fifth* ten thousand one hundred and one ; in the *sixth* one hundred and one thousand and

ten ; in the *seventh*, one million ten thousand one hundred and one ; in the *eighth*, ten million one hundred and one thousand and ten ; in the *ninth*, one hundred and one million ten thousand one hundred and one, &c. &c.

See observations on Numeration after questions applied in simple Subtraction. See page 41.

CARD No. 8. See page 43.

### MULTIPLICATION TABLE.

	2			4	
Twice	1 make	2	Four	1 make	4
Twice	2	4	Four	2	8
Twice	3	6	Four	3	12
Twice	4	8	Four	4	16
Twice	5	10	Four	5	20
Twice	6	12	Four	6	24
Twice	7	14	Four	7	28
Twice	8	16	Four	8	32
Twice	9	18	Four	9	36
Twice	10	20	Four	10	40
Twice	11	22	Four	11	44
Twice	12	24	Four	12	48
	3			5	
Three	1 make	3	Five	1 make	5
Three	2	6	Five	2	10
Three	3	9	Five	3	15
Three	4	12	Five	4	20
Three	5	15	Five	5	25
Three	6	18	Five	6	30
Three	7	21	Five	7	35
Three	8	24	Five	8	40
Three	9	27	Five	9	45
Three	10	30	Five	10	50
Three	11	33	Five	11	55
Three	12	36	Five	12	60

		CARDS.			245
	6			7	
Six	1 make	6	Seven	1 make	7
Six	2	12	Seven	2	14
Six	3	18	Seven	3	21
Six	4	24	Seven	4	28
Six	5	30	Seven	5	35
Six	6	36	Seven	6	42
Six	7	42	Seven	7	49
Six	8	48	Seven	8	56
Six	9	54	Seven	9	63
Six	10	60	Seven	10	70
Six	11	66	Seven	11	77
Six	12	72	Seven	12	84

CARD No. 9.

	8			9	
Eight	1 make	8	Nine	11	99
Eight	2	16	Nine	12	108
Eight	3	24		10	
Eight	4	32	Ten	1 make	10
Eight	5	40	Ten	2	20
Eight	6	48	Ten	3	30
Eight	7	56	Ten	4	40
Eight	8	64	Ten	5	50
Eight	9	72	Ten	6	60
Eight	10	80	Ten	7	70
Eight	11	88	Ten	8	80
Eight	12	96	Ten	9	90
	9		Ten	10	100
Nine	1 make	9	Ten	11	110
Nine	2	18	Ten	12	120
Nine	3	27		11	
Nine	4	36	Eleven	1 make	11
Nine	5	45	Eleven	2	22
Nine	6	54	Eleven	3	33
Nine	7	63	Eleven	4	44
Nine	8	72	Eleven	5	55
Nine	9	81	Eleven	6	66
Nine	10	90	Eleven	7	77

W\*

	11			12	
Eleven	8	88	Twelve	4	48
Eleven	9	99	Twelve	5	60
Eleven	10	110	Twelve	6	72
Eleven	11	121	Twelve	7	84
Eleven	12	132	Twelve	8	96
	12		Twelve	9	108
Twelve	1 make	12	Twelve	10	120
Twelve	2	24	Twelve	11	132
Twelve	3	36	Twelve	12	144

## CARD No. 10.

## SIMPLE MULTIPLICATION.

LESSON 1. *See page 45.*

Multiplicand, 123456 pair.

Multiplier, 2

Product, shoes.

Divisor and } 2)246912  
Dividend, }

Quotient, proof.

LESSON 2. *Page 46.*

Multiplicand, 654321 yards.

Multiplier, 3 feet in a yard.

Product, No. of feet.

Divisor and } 3)1962963  
Dividend, }

Quotient, proof.

LESSON 3. *Page 47.*

Multiplicand, 789 bushels.

Multiplier, 4 pecks in a bushel.

Product,

Divisor and } 4)3156  
Dividend, }

Quotient, 789 proof.

LESSON 4. *Page 47.*

Multiplicand, 987 bills of \$5 each.  
 Multiplier, 5

---

Product, 4935 dollars in all.  
 Divisor and } 5)4935  
 Dividend, }  
 Quotient, proof.

## CARD No. 11.

LESSON 5. *Page 48.*

Multiplicand, 246 fathom.  
 Multiplier, 6

---

Product, feet  
 Divisor and } 6)1476  
 Dividend, }  
 Quotient, proof.

LESSON 6. *Page 48.*

Multiplicand, 400 weeks.  
 Multiplier, 7

---

Product,  
 Divisor and } 7)2800  
 Dividend, }  
 Quotient, proof.

LESSON 7. *Page 49.*

Multiplicand, 9460 dollars of 8s.  
 Multiplier, 8

---

Product, shillings.  
 Divisor and } 8)75680  
 Dividend, }  
 Quotient, proof.



## LESSON 8. Page 49.

Multiplicand, 20000 kegs.  
Multiplier, 9

Product, gallons.  
Divisor and } 9)180000  
Dividend, }  
Quotient, proof.

## CARD No. 12.

## MONEY.

£ stands for pounds, s. for shillings, d. for pence, and q. for farthings.

4 Farthings or q. make 1 Penny.  
12 Pence or d. make 1 Shilling.  
20 Shillings, or s. make 1 Pound, £.

Write the Pence Table on the slate in the following manner:

## PENCE TABLE.

Shillings.			90	pence are	7	6
2	make	24	pence	100	pence are	8 4
3	make	36	pence	110	pence are	9 2
4	make	48	pence	13	pence make	1 1
5	make	60	pence	14	pence make	1 2
6	make	72	pence	15	pence make	1 3
7	make	84	pence	16	pence make	1 4
8	make	96	pence	17	pence make	1 5
9	make	108	pence	18	pence make	1 6
10	make	120	pence	19	pence make	1 7
12	make	144	pence	20	pence make	1 8
Pence.			s.	d.	21	pence make 1 9
20	pence are	1	8	22	pence make	1 10
30	pence are	2	6	23	pence make	1 11
40	pence are	3	4	24	pence make	2 0
50	pence are	4	2	25	pence make	2 1
60	pence are	5	0	26	pence make	2 2
70	pence are	5	10	27	pence make	2 3
80	pence are	6	8	28	pence make	2 4

## CARDS.

249

29	pence	make	2	5	47	pence	make	3	11
30	pence	make	2	6	48	pence	make	4	0
31	pence	make	2	7	49	pence	make	4	1
32	pence	make	2	8	50	pence	make	4	2
33	pence	make	2	9	51	pence	make	4	3
34	pence	make	2	10	52	pence	make	4	4
35	pence	make	2	11	53	pence	make	4	5
36	pence	make	3	0	54	pence	make	4	6
37	pence	make	3	1	55	pence	make	4	7
38	pence	make	3	2	56	pence	make	4	8
39	pence	make	3	3	57	pence	make	4	9
40	pence	make	3	4	58	pence	make	4	10
41	pence	make	3	5	59	pence	make	4	11
42	pence	make	3	6	60	pence	make	5	0
43	pence	make	3	7	61	pence	make	5	1
44	pence	make	3	8	62	pence	make	5	2
45	pence	make	3	9	63	pence	make	5	3
46	pence	make	3	10					

## CARD No. 13.

## COMPOUND ADDITION.

## Lesson 1. Page 55.

£.	s.	d.
72	13	4
89	16	3
21	17	4
32	1	8
61	6	3

## Lesson 2. Page 56.

£.	s.	d.	q.
81	19	4	1
46	7	3	3
31	18	9	3
171	11	5	2
320	10	6	2

## Lesson 3. Page 58.

£158	4	3	0
209	6	4	2
48	10	7	1
61	8	9	3
100	9	11	3
100	0	0	0

## Lesson 4. Page 59.

£21	6	0	0
54	13	0	0
62	15	0	0
35	4	2	0
178	17	3	0
55	19	7	1

## LESSON 5. Page 60.

*A Merchant's Memorandum.*

Broadcloth,	£548	14	6
Coating,	361	16	4
Chints,	249	3	7
Calico;	185	14	6

---

Amount, £

## LESSON 6. Page 61.

*A Bill of Articles Bought.*

4 Yds. Fustian, at 4s.6d.	£0	18	0	0
9 do. Velvet, 9s.4d.	4	4	2	1
16 lbs. Nails, 1s.2d.	0	18	8	0
5 gals. Wine, 12s.4d.	3	1	8	0
4 bush. Salt, 7s.5d.	1	9	8	0
6 lbs. Coffee, 2s.	0	12	0	0
3 do. Hyson Tea, 9s.3d.	1	7	9	0

---

Amount, £12 11 11 1

## LESSON 7. Page 62.

*A Farmer's Bill.*

Sold 10 fat Oxen at £18 12	£186	0	0	0
4 Calves at 45s.	9	0	0	0
15 Sheep, 17s.6d.	13	2	6	0
12 Store Hogs, 25s.3d.	15	3	0	0
4 Fat Swine, 135s.5d.	27	1	8	0
33 bush. Oats, 2s.	3	6	0	0
25 do. Rye, 6s.5d.	8	0	5	0

---

Amount, £261 13 7 0

## LESSON 8. Page 63.

*A Shipper's Memorandum.*

	£.	s.	d.	q.
Paid for House Insurance,	784	13	9	0
Ship Washington Insurance,	867	14	2	2
Duties on the Cargo,	962	13	8	0
Wharfage,	42	11	3	0
Repairs,	250	17	11	0
A balance on Goods,	946	10	4	1

Amount,

## CARD No. 14.

## FEDERAL MONEY, OR DECIMALS.

*Lesson 9. Page 64.*

Cents.

7 8 6 .1

4 6 9 .2

3 4 1 .3

7 8 4 .4

8 7 7 .5

4 8 6 .6

6 2 1 .7

---

43| 6 6 .8*Lesson 10. Page 65.*

Cents.

4 8 6 .8

6 4 2 .9

3 6 4 .5

4 6 8 .75

6 4 2 .6

5 4 4 .4

6 8 1 .3

---

38| 3 1 .25*Lesson 11. Page 66.*

Cents.

8 6 7 .25

5 4 9 .5

6 7 2 .75

8 4 4 .25

6 5 4 .5

4 6 1 .5

7 6 2 .0

*Lesson 12. Page 67.*

Cents.

1 3 4 1 .2

2 4 6 1 .2

1 4 6 0 .1

0 3 4 8 .5

0 2 1 9 .0

0 4 0 0 .0

4 9 1 6 .0

*Lesson 13. Page 68.*

*Cents.*  
 7 0 1 .  
 4 8 0 9 .25  
 4 5 .  
 6 4 .  
 2 0 1 .5  
 8 6 0 0 .  
 1 4 4 2 0 .75

---

*Lesson 14. Page. 68*

*Dollars.*  
 3 4 5 0 .  
 2 5 0 0 .  
 1 2 0 .  
 2 8 8 .  
 1 9 2 .  
 2 0 6 .25  
 1 1 4 0 .

---

## CARD No. 15.

## COMPOUND SUBTRACTION.

*Lesson 1st.*

Page 72.

£.	s.	d.	q.
762	14	6	1
691	11	3	2

---

*Lesson 2nd.*

Page 72

£.	s.	d.	q.
664	17	3	2
375	18	4	3

---

*Lesson 3rd.*

Page 73. ♡

£.	s.	d.	q.
361	16	3	2
48	16	4	1

---

*Lesson 4th.*

Page 74.

£	s.	d.	q.
1000	0	0	0
145	11	0	2

---

*Lesson 5th.*

Page 75.

Dollars.	Cents.
84668	25.5
33768	75.7

---

*Lesson 6th.*

Page 75.

Dollars.	Cents.
87654	37.5
33654	75.

---

**CARD No. 15.**  
**COMPOUND SUBTRACTION.**

*Lesson 7th.*

Page 76.

**MEMORANDUM.**

**Received, 8th May, 1815, these several sums :**

	Dollars.	Cents.
From Government,	221855	25.5
From New-York,	378650	37.5
From Pennsylvania,	183210	50.
From Baltimore,	134765	75.

Amounting to      918481    87.5

**Paid out in manner as follows.**

	Dollars.	Cents.
To the Surg. General,	312750	48.5
To Amer. Invalids,	156375	24.25
To Brit. Invalids,	156375	24.25

Paid out in all,      625500    97.00

**What sum remains on hand ?**

Received in all,      \$918481    87.5

Paid in all,      \$625500    97.

**After taking the given sums, turn the Card out of view, before adding or subtracting. Let the Key be your guide.**

**CARD No. 16.**

**ADDITION.**

Page 80.

5 and 3 are  
 5 and 6 are  
 5 and 4 are  
 5 and 8 are  
 6 and 7 are  
 8 and 3 are

7 and 5 are  
 9 and 4 are  
 10 and 6 are  
 11 and 7 are  
 9 and 6 are  
 5 and 11 are  
 12 and 7 are  
 13 and 5 are

X

15 and 9 are  
 13 and 7 are  
 14 and 6 are  
 14 and 9 are  
 17 and 8 are  
 16 and 5 are  
 15 and 8 are  
 19 and 9 are

3 from 11  
 5 from 12  
 4 from 13  
 6 from 16  
 7 from 18  
 6 from 15  
 11 from 16  
 7 from 19  
 5 from 18  
 9 from 24  
 7 from 20  
 6 from 20  
 9 from 23  
 8 from 25  
 5 from 21  
 8 from 23  
 9 from 28

## SUBTRACTION.

Page 80.

remain

3 from 8  
 6 from 11  
 4 from 9  
 8 from 13  
 7 from 13

## CARD No. 16.

## MULTIPLICATION.

Page 81.

Twice 12 are  
 3 times 12 are  
 6 times 7 are  
 0 times 9 are  
 7 times 8 are  
 7 times 9 are  
 5 times 3 are  
 5 times 7 are  
 5 times 9 are  
 4 times 12 are  
 4 times 11 are  
 8 times 9 are  
 8 times 5 are  
 8 times 8 are  
 8 times 12 are  
 6 times 4 are  
 10 times 12 are

11 times 7 are  
 11 times 5 are  
 10 times 11 are  
 12 times 11 are  
 11 times 11 are

## DIVISION.

Page 81.

3 in 15  
 5 in 40  
 5 in 55  
 7 in 42  
 7 in 35  
 9 in 77  
 8 in 56  
 8 in 64  
 9 in 54  
 9 in 63  
 9 in 45  
 9 in 72

11 in 44  
 11 in 110  
 11 in 132  
 11 in 121  
 4 in 32

12 in 24  
 12 in 36  
 12 in 48  
 12 in 96  
 12 in 120

## CARD No. 17.

## COMPOUND MULTIPLICATION.

*Lesson 1. Page 83.*

£32 16 8 2  
 2

*Proof of Lesson 1.*

Page 84.

2)65 13 5 0

*Lesson 2. Page 84.*

£2 5 6 1  
 3

*Proof of Lesson 2.*

Page 85.

3)6 16 6 3

*Lesson 3. Page 85.*

£16 16 11 2  
 4

*Proof of Lesson 3.*

Page 86.

4)67 7 10

*Lesson 4. Page 87.*

£24 17 4 3  
 5

*Proof of Lesson 4.*

Page 87.

5)124 6 11 3

*Lesson 5. Page 88.*

£0 7 11 1  
 6

*Proof of Lesson 5.*

Page 88.

6)2 7 7 2

*Lesson 6. Page 89.*

£2 7 8 1  
 7

*Proof of Lesson 6.*

Page 90.

7)16 13 9 3

*Lesson 7. Page 90.*

£80 14 6 2  
 8

*Proof of Lesson 7.*

Page 91.

8)645 16 4 0

*Lesson 8. Page 92.*

£0 10 4 2  
 9

*Proof of Lesson 8.*

Page 92.

9)4 13 4 2



## CARD No. 18.

*Lesson 9. Page 93.*

£0 14 4 2  
10

---

*Lesson 10. Page 94.*

£6 17 3 3  
11

---

*Lesson 11. Page 95.*

£1 16 4 2  
12

---

*Lesson 12. Page 96.*

£14 16 8 2  
12

---

*Lesson 13.*

Page 98.  
£17 6 8  
2

---

*Lesson 14.*

Page 99.  
£461 17 4  
5

---

*Lesson 15.*

Page 101.  
£0 18 9  
4

---

*Lesson 16.*

Page 101.  
£0 19 6  
4

---

*Proof of Lesson 9.*

Page 93.  
10)7 3 9 0

---

*Proof of Lesson 10.*

Page 94.  
11)75 10 5 1

---

*Proof of Lesson 11.*

Page 96.  
12)21 16 6 0

---

*Proof of Lesson 12.*

Page 97.  
£192 17 2 2  
—14 16 8 2

---

*Lesson 13. 2d. part.*

Page 99.  
£34 13 4  
7

---

*Lesson 14. 2d. part.*

Page 100.  
£2309 6 8  
3

---

*Lesson 15. 2d. part.*

Page 101.  
£3 15  
4

---

*Lesson 16. 2d. part.*

Page 102.  
£3 18 0  
4

---

pro.  
£0 19 6+

## CARD No. 19.

*Lesson 17. Page 103.*

£0 5 9  
 7

---

5

---

£10 1 3

*Lesson 18. Page 104.*

£1 0 0 1  
 10

---

10

---

7

---

£3 12 11

*Lesson 19. Page 105.*

£0 3 7  
 7

---

8

---

0 3 7

---

£10 4 3

*Lesson 20. Page 106.*

£0 7 9 1 p.  
 6

---

6 p.

---

11

---

X\*

£25 11 6 66 p.  
 15 6 2 p.

---

68 p.

*Lesson 21. Page 107.*

A £0 0 4 2  
 10

---

B 3 9 0  
 10

---

C 1 17 6 0  
 11

---

D 20 12 6 0

---

Aa 4 2  
 11

---

E 4 1 2  
 5

---

F 1 0 7 2  
 Dd 20 12 6 0

---

G £21 13 1 2

---

*Lesson 22. Page 110.*

£0 17 5  
 8

---

6 19 4  
 7

---

48 15 4  
 2

---

£97 10 8

*Lesson 23. Page 112.*

£0 0 5  
7

---

2 11  
8

---

1 3 4 *Contin.*

*Continued.*

1 3 4  
2

---

2 6 8

CARD No. 20.

MULTIPLICATION.

*Lesson 1. Page 113.*

Multiplicand,  
Multiplier,

4 6 4 3 2  
5 2 4

Intermediate products,

{ 1 8 5 7 2 8  
9 2 8 6 4  
2 3 2 1 6 0

Total product,

---

2 4, 3 3 0, 3 6 8

*Lesson 2. Page 115.*

Multiplicand,  
Multiplier,

6 1 2 4 8  
7 3 2

Intermediate products,

{ 1 2 2 4 9 6  
1 6 3 7 4 4  
4 2 8 7 3 6

Total product,

---

4 4, 3 3 3, 5 3 6

*Lesson 3. Page 115.*

Multiplicand,  
Multiplier,

1 6 7 3 9  
2 8 7

1 1 7 1 7 3  
1 3 3 9 1 2  
3 3 4 7 8

Product,

---

4, 8 0 4, 0 9 3

*Lesson 4. Page 117.*

Multiplicand,	4 5 6 7
Multiplier,	6 5 2 4
	<hr/>
	1 8 2 6 8
	9 1 3 4
	2 2 8 3 5
	2 7 4 0 2
	<hr/>
Product,	2 9, 7 9 5, 1 0 8

## CARD No. 21.

## MULTIPLICATION.

*Lesson 5th. Page 118.*

Multiplicand,	4 8 7 6
Multiplier,	6 5 4 3
	<hr/>
	1 4 6 2 8
	1 9 5 0 4
	2 4 3 8 0
	2 9 3 5 6
	<hr/>
Product,	3 1, 9 0 3, 6 6 8

*Lesson 6th. Page 119.*

Multiplicand,	5 6 7 8
Multiplier,	8 7 6 5
	<hr/>
	2 8 3 9 0
	3 4 0 6 8
	3 9 7 4 6
	4 5 4 2 4
	<hr/>
Product,	4 9, 7 6 7, 6 7 0

*Lesson 7th. Page 120.*

Multiplicand      9 8 7 0 0  
 Multiplier,      6 5 4 0

---

3 9 4 8  
 4 9 3 5  
 5 9 2 2

---

Product,      6 4 5, 4 9 8, 0 0 0

*Lesson 8th. Page 120.*

Multiplicand,      4 0 7 8 0  
 Multiplier,      1 6 0 0

---

2 4 4 6 8  
 4 0 7 8

---

Product,      6 5, 2 4 8, 0 0 0

*Lesson 9th. Page 121.*

9 9 9 0 0  
 7 0 0

---

Product,      6 9, 9 3 0, 0 0 0

## CARD No. 22.

† DIVISION TABLE *Part 1st.*

The first and second part of the division table, and the multiplication table, must be transcribed previously to any other : they must be suspended around the room for frequent inspection, and a small degree of preference should be given to those who will excel in rehearsing them. Transcripts taken and carried home, will expedite proficiency.

1,	1 in 1, once	1 in 5, 5 times
1 in 1,	once	1 in 6, 6 times
1 in 2,	twice	1 in 7, 7 times
1 in 3,	3 times	1 in 8, 8 times
1 in 4,	4 times	1 in 9, 9 times

1 in 10, 10 times  
 1 in 11, 11 times  
 1 in 12, 12 times  
     2,  
 2 in 2, once  
 2 in 4, twice  
 2 in 6, 3 times  
 2 in 8, 4 times  
 2 in 10, 5 times  
 2 in 12, 6 times  
 2 in 14, 7 times  
 2 in 16, 8 times  
 2 in 18, 9 times  
 2 in 20, 10 times  
 2 in 22, 11 times  
 2 in 24, 12 times  
     3,  
 3 in 3, once  
 3 in 6, twice  
 3 in 9, 3 times  
 3 in 12, 4 times  
 3 in 15, 5 times  
 3 in 18, 6 times  
 3 in 21, 7 times  
 3 in 24, 8 times  
 3 in 27, 9 times  
 3 in 30, 10 times  
 3 in 33, 11 times  
 3 in 36, 12 times  
     4,  
 4 in 4 once  
 4 in 8 twice  
 4 in 12, 3 times  
 4 in 16, 4 times  
 4 in 20, 5 times  
 4 in 24, 6 times  
 4 in 28, 7 times  
 4 in 32, 8 times

4 in 36, 9 times  
 4 in 40, 10 times  
 4 in 44, 11 times  
 4 in 48, 12 times  
     5,  
 5 in 5, once  
 5 in 10, twice  
 5 in 15, 3 times  
 5 in 20, 4 times  
 5 in 25, 5 times  
 5 in 30, 6 times  
 5 in 35, 7 times  
 5 in 40, 8 times  
 5 in 45, 9 times  
 5 in 50, 10 times  
 5 in 55, 11 times  
 5 in 60, 12 times  
     6,  
 6 in 6, once  
 6 in 12, twice  
 6 in 18, 3 times  
 6 in 24, 4 times  
 6 in 30, 5 times  
 6 in 36, 6 times  
 6 in 42, 7 times  
 6 in 48, 8 times  
 6 in 54, 9 times  
 6 in 60, 10 times  
 6 in 66, 11 times  
 6 in 72, 12 times  
     7,  
 7 in 7, once  
 7 in 14, twice  
 7 in 21, 3 times  
 7 in 28, 4 times  
 7 in 35, 5 times  
 7 in 42, 6 times  
 7 in 49, 7 times

7	in 56,	8 times	10	in 40,	4 times
7	in 63,	9 times	10	in 50,	5 times
7	in 70,	10 times	10	in 60,	6 times
7	in 77,	11 times	10	in 70,	7 times
7	in 84,	12 times	10	in 80,	8 times
	8,		10	in 90,	9 times
8	in 8,	once	10	in 100,	10 times
8	in 16,	twice	10	in 110,	11 times
8	in 24,	3 times	10	in 120,	12 times
8	in 32,	4 times		11,	
8	in 40,	5 times	11	in 11,	once,
8	in 48,	6 times	11	in 22,	twice
8	in 56,	7 times	11	in 33,	3 times
8	in 64,	8 times	11	in 44,	4 times
8	in 72,	9 times	11	in 55,	5 times
8	in 80,	10 times	11	in 66,	6 times
8	in 88,	11 times	11	in 77,	7 times
8	in 96,	12 times	11	in 88,	8 times
	9		11	in 99,	9 times
9	in 9,	once	11	in 110,	10 times
9	in 18,	twice	11	in 121,	11 times
9	in 27,	3 times	11	in 132,	12 times
9	in 36,	4 times		12,	
9	in 45,	5 times	12	in 12,	once
9	in 54,	6 times	12	in 24,	twice
9	in 63,	7 times	12	in 36,	3 times
9	in 72,	8 times	12	in 48,	4 times
9	in 81,	9 times	12	in 60,	5 times
9	in 90,	10 times	12	in 72,	6 times
9	in 99,	11 times	12	in 84,	7 times
9	in 108,	12 times	12	in 96,	8 times
	10,		12	in 108,	9 times
10	in 10,	once	12	in 120,	10 times
10	in 20,	twice	12	in 132,	11 times
10	in 30,	3 times	12	in 144,	12 times

## CARD No. 22.

DIVISION TABLE, *Part 2nd.*

Page 125.

		12,					16,	
12	in	24,	twice		16	in	32,	twice
12	in	36,	3 times		16	in	48,	3 times
12	in	48,	4 times		16	in	64,	4 times
12	in	60,	5 times		16	in	80,	5 times
12	in	72,	6 times		16	in	96,	6 times
12	in	84,	7 times		16	in	112,	7 times
12	in	96,	8 times		16	in	123,	8 times
12	in	108,	9 times		16	in	144,	9 times
		13,					17,	
13	in	26,	twice		17	in	34,	twice
13	in	39,	3 times		17	in	51,	3 times
13	in	52,	4 times		17	in	68,	4 times
13	in	65,	5 times		17	in	85,	5 times
13	in	78,	6 times		17	in	102,	6 times
13	in	91,	7 times		17	in	119,	7 times
13	in	104,	8 times		17	in	136,	8 times
13	in	117,	9 times		17	in	153,	9 times
		14,					18,	
14	in	28,	twice		18	in	36,	twice
14	in	42,	3 times		18	in	54,	3 times
14	in	56,	4 times		18	in	72,	4 times
14	in	70,	5 times		18	in	90,	5 times
14	in	84,	6 times		18	in	108,	6 times
14	in	98,	7 times		18	in	226,	7 times
14	in	112,	8 times		18	in	144,	8 times
14	in	126,	9 times		18	in	162,	9 times
		15,					19,	
15	in	30,	twice		19	in	38,	twice
15	in	45,	3 times		19	in	57,	3 times
15	in	60,	4 times		19	in	76,	4 times
15	in	75,	5 times		19	in	95,	5 times
15	in	90,	6 times		19	in	114,	6 times
15	in	105,	7 times		19	in	133,	7 times
15	in	120,	8 times		19	in	152,	8 times
15	in	135,	9 times		19	in	171,	9 times



## CARD No. 23.

## LONG DIVISION.

**Lesson 1. Page 125.**  
*Divisor. Div'nd. Quo't.*

16) 9392(4962

64

153

144

.. 99

96

. 32

. 32

**Lesson 2. Page 127.**

*Divisor. Div. Quot.*

17)48297(

**Lesson 3. Page 128.**

*Divisor. Div. Quot.*

24)95638(

**Lesson 4. Pages 129, 142.**

*Divisor. Div. Quot.*

78)418392(

**Lesson 5. Pages 131, 142.**

*Divisor. Div. Quot.*

96)651744(

**Lesson 6. Pages 132, 142.**

*Divisor. Div. Quot.*

95)977724(

**Lesson 7. Pages 133, 142.**

*Divisor. Div. Quot.*

182)34615(

**Lesson 8. Pages 134, 143.**

*Divisor. Div. Quot.*

194)64329(

**Lesson 9. Pages 135, 143.**

*Divisor. Div. Quot.*

43)00681927(1597387

## CARD No. 24.

**Lesson 10. Page 136.**

*Divisor. Div. Quot.*

56)0012882(41)

**Lesson 11. Page 137.**

*Divisor. Div. Quot.*

345)3128187(

**Lesson 12. Page 138.**

*Divisor. Div. Quot.*

123)123456789(

**Lesson 13. Page 140.**

*Divisor. Dividend.*

20)78133

**Lesson 14. Page 141.**

*Divisor. Dividend.*

40)98643

**Lesson 15. Page 141.**

*Divisor. Dividend.*

60)39545

**PROOF OF LONG DIVISION.***Lesson 4. Page 142.*

The Quotient is	5 3 6 4
The Divisor,	7 8

---

*Lesson 5. Page 142.*

The Quotient is	6 7 8 9
The Divisor,	9 6*

---

*Lesson 6. Page 142.*

The Quotient is	9 8 7 6
The Divisor,	9 9

---

*Lesson 7. Page 142.*

The Divisor,	1 8 2
The Quotient,	1 9 0 Rem. 35.

---

*Lesson 8. Page 143.*

The Divisor is	1 9 4
The Quotient,	3 3 1 Rem. 115

---

*Lesson 9. Page 143.*

The Quotient is	1 5 9
The Divisor,	4 3 0 0 Rem. 1227

**CARD No. 25.****COMPOUND DIVISION.***Lesson 1. Page 144.*

4)784l. 16s. 4d.

*Lesson 2. Page 144.*

8)1454l. 19s. 0d. 0q.

*Lesson 3. Page 145.*

12)1173l. 12s. 9d. 0q.

*Lesson 4. Page 145.*

19)35l. 12s. 6d.(1l.

19

16

20

19)332(17s. Continued.

\*The divisor in Lesson 5, page 142 should be 96.

19)332(17s. Contin.

19

---

142

133

---

..9

12

---

19)114(6d.

114

---

...

NOTE.—Let all pupils omit Weights and Measures, till coming to Reduction. It has been too fashionable to puzzle young learners in the ground rules.

Lesson 5. Page 147.

£. s. d.

23)179 17 7(

Lesson 6. Page 148.

£. s. d.

26)239 4 0(

Lesson 7. Page 149.

£. s.

33)486 15(

Lesson 8. Page 149.

£. s. d.

47)566 7 0(

Lesson 9. Page 150.

£. s. d.

89)28 3 8(

Lesson 10. Page 151.

£ s. d. q.

2 19 11 1

4

Lesson 11. Page 152.

£9 8 4

4

Lesson 12. Page 153.

£34 0 3 3

4

Lesson 13. Page 154.

s. d. q.

7)79 4

8)

2)

Lesson 14. Page 155.

£ s. d. q.

5)14 11 8

8)

7)

2)

## CARD No. 26.

## DECIMALS.

*Arithmetical Characters.* Page 158.

= Equal to. + More or Addition. — Less, or  
 Subtraction. × Multiplication. ) ( ÷ Division.

f :: : Proportion. See explanation, page 194.

| — Square.

✓ Square Root.

*Lesson 1.* Page 160.

4)1.00(.25

8

—  
20

20

*Lesson 2.* Page 161.

2)1.0(.5

10

*Lesson 3.* Page 162.

4)3.00(

*Lesson 4.* Page 162.

20)19.00(

*Lesson 5.* Page 162.

8)7.000(

*Lesson 6.* Page 162.

.25 hundredths

.5 tenths

.75 hundredths

.875 thousandths

.95 hundredths

*Lesson 7.* Page 163.

£3.325

20

Shillings, 6.500

12

Pence, 6.000

*Proof of Lesson 6th and 7th, Page 163, by mental  
 and practical calculation.*

 $\frac{1}{4}$  or .25 of a pound = £0 5 0 $\frac{1}{2}$  or .5 of a pound = 0 10 0 $\frac{3}{4}$  or .75 of a pound = 0 15 0 $\frac{7}{8}$  or .875 of a pound = 0 17 6 $\frac{15}{16}$  or .95 of a pound = 0 19 0

£3 6 6

## CARD No. 27.

*Lesson 8. Page 164.*  
12)1.000(

*Lesson 9. Page 165.*  
15)8.00000(

**TABLE. Page 166.**

. Units,  
1 Tenths,  
2 Hundredths,  
3 Thousandths,  
4 Tens of Thousandths,  
5 100 of Thousandths,  
6 Millionths.

*Lesson 10. Page 167.*  
.25  
100

*Lesson 11. Page 168.*  
.5  
100

*Lesson 12. Page 168.*  
.75  
20

*Lesson 13. Page 168.*  
.875  
100

*Lesson 14. Page 169.*  
.8  
100

*Lesson 15. Page 169.*  
.75  
12

*Lesson 16. Page 169.*  
.95  
20

*Lesson 17. Page 169.*  
.8125  
12

*Lesson 18. Page 169.*  
.0625  
112

*Lesson 19. Page 169.*  
.1875  
112

*Lesson 20. Page 169.*  
.75  
60

*Lesson 21. Page 169.*  
.790625  
20

*Lesson 22. Page 170.*  
.1875  
20

*Lesson 23. Page 170.*  
4.3.

12.9.75  
20.15.8125(.790625  
140

---

.181  
180

---

..125  
120

---

..50\*  
40

---

100\*  
100  

---

000

## CARD No. 28.

*Lesson 24. Page 171.*

4		3.
12.		6.
20.		12.

*Lesson 25. Page 171.*

4		3.
12.		9.

*Lesson 26. Page 171.*

4		3.
12.		0.

*Lesson 27. Page 171.*

12.		6.
8.		3.

*Lesson 28. Page 172.*

12.		3.
8.		7.

*Lesson 29. Page 172.*

12.		6.
6.		2.

*Lesson 30. Page 172.*

12.		9.
7.5		3.

*Lesson 31. Page 172.*

4.		2.
12.		10.
7.5		1.

*Lesson 32. Page 172.*

£25 17 6

## REDUCTION.—AVOIRDUPOIS WEIGHT.

*Lesson 1. Page 177.*

lb.	
6 0	144 0
24. bush.	

*Lesson 2. Page 177.*

lb.	
6 0	18000
2 0	

loads.

*Lesson 3. Page 177.*

1	Load, 1235 lb.
2	1245
3	1231
4	1242

6|0)495|3

82 B. 33 lb.

*Lesson 4. Page 177.*

cut.	qr.	lb.
14	2	25

*Directions.*

$$14 \times 4 + 2 = 58$$

$$58 \times 28 + 25 = 1649$$
*Lesson 5. Page 177.*

lb.
1649.

*Directions.*

$$1649 \div 28 = 58 \text{ and } 25 \text{ over.}$$

$$58 \div 4 = 14 \text{ and } 2 \text{ over.}$$
*Lesson 6. Page 178.*

oz.
33152.

Y\*

## CARD No. 29.

## TROY WEIGHT.

*Lesson 1. Page 179.*

lb. oz.

30 11

12

---

20

---

*Lesson 2. Page 179.*

lb. oz. pwt.

8 3 15

12

NOTE.—Card No. 30 omitted.

## CARD No. 31.

## PROPORTION.

*Lesson A. Page 195.*

B. s. B.

2 : 6 :: 4

*Lesson 1. Page 196.*

lb. d. lb.

5 : 60 :: 9

*Lesson 3. Page 196.*

lb. d. lb.

1 : 16 :: 5

*Lesson 5. Page 197.*

yds. s. yd.

432 : 1728 :: 1

*Lesson B. Page 195.*

B. s. B.

2 : 4 :: 7

*Lesson 2. Page 196.*

lb. d. lb.

5 : 80 :: 1

*Lesson 4. Page 197.*

P. s. P.

8 : 1152 :: 12

*Lesson 6. Page 198.*

H. B. H.

6 : 9 :: 24

*Lesson 7. Page 199.*

B. s. B.

144 : 50 :: 12

## CARD No. 32.

## INTEREST.

*Lesson 3. Page 206.*

£13 17s. 6d. principal.

6 rate per cent.

---

83 5 0 *Continued.*

83 5 0 *Continued.*

20

Cutting off two ciphers divides  
by 100.

s. 16|65

12

d. 7|80

4

q. 3|20 Interest £0 16s. 7d. 3q.  $\frac{38}{100}$ *Lesson 4. Page 207.*

155 dol. = 15500 cents principal.

2

31000 product by 2.

7750 half the principal.

387|50

Answer, \$3 87 .5 cents, interest 1 year.

*Lesson 5. Page 207.*

Principal, 23100

Rate per cent, 3.25

1155

462

693

Int. 1 year at  $3\frac{1}{4}$  per cent. 750|75.00



## BOOK-KEEPING

Is a critical and curious art by itself; and ought to be studied as a distinct science and separately from all other professional employments: Then, through the occurrences of life, it may be blended with any business which shall require its aid.

As many country merchants, tradesmen, mechanics, and farmers, have not an opportunity to learn book-keeping in a full and formal manner, it may not be amiss to insert a few sketches applicable to their business. But, when a young man means to be an accomplished accountant, he must have recourse to some instructor who is able to teach him the art of keeping accounts in all the various useful forms.

*Description and form of a set of books, for a country merchant, or for a mechanic who has occasion to make many entries in a day.*

First, let him have an Invoice book, in which if he please, he may enter an inventory of his estate; and afterwards enter or copy bills of goods and the names of the persons from whom purchases are made, the time when interest commences, when payable, &c.

Second, prepare a Blotter, in which may be inserted all commercial business occurring throughout the day. This may be written in form of a Day-book, but more expeditiously.

Third, where Potash is manufactured let there be an Ash-book, in which set the day of the month, the names of persons delivering ashes, and the number of bushels delivered: also credit those ashes to the respective owners in the blotter.

Fourth, procure a Day-book, and transcribe the Blotter every night into the Day-book in a neat fair

hand writing ; or, where considerable business is done, let the Blotter be made in daily parts, and given over to a clerk for transcription and to be attached to the former ones.—Save these blotters for an evidence of the first entries in case of dispute.

Fifth, have a Ledger, into which must be posted all accounts of debt and credit on such pages as are noted in the alphabet ; and the figures of reference in the margin of the Day-book must be post-marked with a double inclining dash. A cash account may be in the Ledger.

Sixth, a Receipt-book, in which take receipts for all money paid out ; this will save much time in thumbing over bundles of papers.

# BOOK-KEEPING.

## DAY-BOOK A. Page 1.

Ledg. No. 1.

		January 1, 1834.			
page				\$	cts.
1	JOHN TRADEWELL, of Albany, Dr.				
	To joiner work 1 day by my apprentice Ralph,			1	50
	To 10 pine boards, 14 feet each, 140 feet, at \$12 per M.			1	68
				3	18
				<u>    </u>	<u>    </u>
	Cr.				
	By 100 gal. Wine, at 125 cents,	125	00		
1	36 yds. Broadcloth, 400	144	00		
	19 bush. Salt, 112½	21	37½		
	36 gal. Molasses, 75	27	00		
	Payable in 90 days without interest.				
	See Invoice Book No. 1, page 1.	317	37½		
		<u>    </u>	<u>    </u>		
	2				
1	JOHN TRADEWELL, Dr.				
	To 2 days of joiner work, by Ralph and James,			3	00
				<u>    </u>	<u>    </u>
	3				
	PETER PAYMENT, of Bern, Dr.				
1	To 5 gal. Wine, at 150 cents,	7	50		
	1 bush. Salt,	1	25		
	2 gal. Molasses, 100	2	00		
	2 yds Broadcloth, 450	9	00		
		19	75		
		<u>    </u>	<u>    </u>		
	Cr.				
1	By Cash, \$12 50				
	By his note on demand for 7 25			19	75
		<u>    </u>	<u>    </u>		

## DAY-BOOK A, Page 1.

Ledg. No. 1.

page		January 4, 1834.	Dr.	\$	cts.
1	To 4 gal. Molasses, at 100 cents,			4	00
	2 bush. Salt, 125			2	50
				6	50
<hr/>					
1	JOHN TRADEWELL,		Dr.		
	To 2 days joinering, by Ralph,			3	00
				5	
<hr/>					
1	SIMON HOPEWELL,		Dr.		
	To 4 yds. Broadcloth, at 450 cents,			18	00
	6 gal. Wine, 150			9	00
	3 bush. Salt, 125			3	75
				30	75
<hr/>					
1	JACOB HALEON,		Dr.		
	To 4 yds. Broadcloth, at 450 cents.			18	00
	2 bush. Salt, 125			2	50
	2 gal. Molasses, 100			2	00
				22	50
<hr/>					
				6	

## DAY BOOK A, Page 2.

Ledg. No. 1.

page		January 6th, 1834.	Dr.	\$	cts.
1	JOHN TRADEWELL,		Dr.		
	To 150 feet pine boards, at \$12 per M.			1	80
				8	
<hr/>					
1	PETER PAYMENT,		Dr.		
	To his note of 3d instant, given up,			7	25
1	Cr.				
	By Cash, \$7 25				
				8	
<hr/>					
1	SILAS ANDOVER,		Dr.		
	To 1 gal. Wine,			1	50
1	Cr.				
	By 2 bush. Corn, at 75 cents,			1	50

## DAY-BOOK A, Page 2.

Ledg. No. 1.

page		January 8, 1834.	Dr.	\$	cts
1	ISAAC HEARTY,				
	To 3 gal. Molasses, at 100 cents,			3	00
1		Cr.			
	By $\frac{1}{2}$ bush. Rye,				50
1		9			
1	JOHN TRADEWELL,		Dr.		
	To Cash, as per receipt,			55	00
1		9			
1	AMOS LOOKOUT,		Dr.		
	To 2 yds. Broadcloth, at 450 cents,			9	00
1		Cr.			
	By his Note, payable in 30 days, \$15 50				
1		9			
1	SIMON HOPEWELL,		Dr.		
	To 1 bush. Salt,			1	25
1		Cr.			
	By his Note on demand, for			32	00
1		10			
1	JACOB HALEON,		Dr.		
	To 1 $\frac{1}{2}$ yd. Broadcloth, at 450 cents,			6	75
1		Cr.			
	By Cash,	\$5 00			
1	his Note on demand, for	24 25			
1		11		29	25
1	PETER PAYMENT,		Dr.		
	To 4 gal. Molasses, at 100 cents,			4	00
1	1 bush. Salt,			1	25
1		Cr.			
	By a negotiable Note on J. G. for \$5 25			5	25

## DAY-BOOK A, Page 3.

Ledg. No. 1

page		January 12, 1834.	Dr.	\$	cts.
1	To Cash, as per receipt,	JOHN TRADEWELL,		44	68
	14 lb. 10d. Nails, at 12 cents,			1	68
				46	36
		12			
1	To 1 barrel Wine, containing $31\frac{1}{2}$ gals., at	SILAS ANDOVER,	Dr.		
	150 cents,			47	25
	9 bush. Salt, at 125 cents			11	25
				58	50
1		Cr.			
	By abatement on the above, \$1 46				
	Cash, 33 50				
	his note of hand, for 22 04			57	00
		13			
1	To 15 gals. Wine, at 150 cents,.	ISAAC HEARTY,	Dr.	22	50
1	By Cash, \$15 00	Cr.			
	his Note at 30 days, 10 00			25	00
		13			
1	To Cash as per receipt,	JOHN TRADEWELL,	Dr.	75	00
	— 15 —				
	To 34 panes of Glass, at 9 cents,			3	06
				78	06

## LEDGER No. 1, Page-1.

JOHN TRADEWELL, Dr.

D. Book Page	A.		D. Book Page	A.	\$	cts.
1		Sundries, \$3.18				
1		Work, 3.00				
2		Cash, 55.00				
3		Cash, 75.00				
		Work, \$3.00	1		6	18
		Boards, 1.80	2		4	80
		Sundries, 46.36	3		101	36
		Glass, 3.06	3		78	06
		January 15th, 1834.			190	40
		To my note at 75 days for			126	97½
		Balanced 15th January, 1834.			317	37½
		<b>PETER PAYMENT, Dr.</b>				
1		Sundries, \$19.75				
2		Sundries, 5.25				
		Note, \$7.25	2		27	00
					5	25
		Balanced, 11th January, 1834.			32	25
		<b>AMOS LOOKOUT, Dr.</b>				
1		Sundries, \$6.50				
		Broadcloth, \$9.00	2		15	50
		<b>SIMON HOPEWELL, Dr.</b>				
1		Sundries, \$30.75				
		Salt, \$1.25	2		32	00
		<b>JACOB HALEON, Dr.</b>				
1		Sundries, \$22.50				
		Broadcloth, \$6.75	2		29	25
		Jan. 15, 1834. To your Note given up.			24	25
					53	50
		<b>SILAS ANDOVER, Dr.</b>				
2		Wine, \$1.50				
		Sundries, \$58.50	3		60	00
		Balanced 14th January, 1834, /			60	00
		<b>ISAAC HEARTY, Dr.</b>				
2		Molasses, \$3.00				
		Wine, \$22.50	3		25	50

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JOHN TRADEWELL, Cr.

FD-302 (Rev. 11-27-70)

1 Sundries, \$317.37

Page RD. Book A.

\$	cts
317	37 1/2

January 15th, 1834.  
Balanced by note.

31737½

PETER PAYMENT, Cr.

1	Sundries, \$19.75	Cash, \$7.25
2	Note, 5.25	

2	27	00
	5	25

Balanced 11th January, 1834.

32 25

**AMOS LOOKOUT, Cr.**

2 | Note payable at 30 days,

15	50
----	----

SIMON HOPEWELL, Cr.

2 | Note on demand,

32 00

JACOB HALEON, Cr.

2	Note, \$24.25	Cash, \$5.00
	January 15th, 1834. By Cash for Note	

2	29	25
	24	25

53	50
----	----

SILAS ANDOVER, Cr.

2	Corn, \$1.50	Sundries, \$57.00.
	Jan. 14th, 1834.	By Cash in full.

3	58	50
	1	50

60	00
----	----

ISAAC HEARTY, Cr.

2 Rye, \$0.50      Sundries, \$25.00.

3	25	50
---	----	----



## A FARMER'S ACCOUNT.

A mechanic who can attend to enter all his charges without being hurried, may omit the blot-book, and make his original entries in the day-book ; or he may keep his accounts in the following manner with a ledger only.

A. D. 1834.		GEORGE REYNOLDS,	Dr.	\$	cts.
January	1	To 3 bushels Rye,	at 106 cents,	3	18
	5	To 5 lb. Butter,	15		75
	8	To 1 pair men's Shoes,		1	75
		1 pair woman's do.		1	50
	12	To 23 lb. Soleleather,	at 25	5	75
February	6	To 7 bushels Indian corn,	75	5	25
	8	To 1 Ploughshare-mould, wt. 56 lb.		4	48
	10	To an old ox-yoke and irons per } agreement in presence of A. B.C. }		3	12½
	12	To 1 wax Calfskin for your boots,		2	75
	14	To 19 lb. Mutton, at 5 cents,			95
	15	To my paying the post for your } newspapers, as per receipt, }		1	00
				30	48½

## A FARMER'S ACCOUNT.

**A. D. 1834.**  
**January**

**GEORGE REYNOLDS,**

Cr. | \$ | cts.

1	By yourself and oxen 1 day,	1 25
3	By 4 cords of Wood at 175 cents,	7 00
5	By transporting a load of Boards to Albany, per agreement,	3 00
8	By 1 barrel Cider,	4 00
10	By 1 hive of Bees,	5 37½
		<hr/>
		20 62½
		<hr/>
Jan. 15th, by a Note,		9 86
		<hr/>
Balanced 15th Jan. 1834.		30 48½

$$\mathbf{Z}^*$$

## INVOICE BOOK No. 1. Page 1.

No. 1. An Inventory of the Estate of *Gideon Wealthy*,  
taken at Albany, January 1, 1834.

	\$	cents.
1 Yoke of Oxen valued at . . . . .	75	00
1 House, Lot No. — in — Street, . . . . .	1200	00
Cash, . . . . .	500	00
	<hr/>	
	1775	00

## No. 2. COPY OF JOHN TRADEWELL'S BILL.

*Mr. Gideon Wealthy,*

Bought of *John Tradewell*, January 1, 1834.

	\$	cents.
100 Gal. Wine, at 125 cents, . . . . .	125	00
36 Yds Broadcloth, 400 . . . . .	144	00
19 Bush. Salt, 112½ . . . . .	21	37½
36 Gal. Molasses, 75 . . . . .	27	00
	<hr/>	
	317	37½

Payable in 90 days without Interest.

See Day-book A. Page 1.

## No. 3. COPY OF ELISHA MERCHANT'S BILL.

*Mr. Gideon Wealthy,*

Bought of *Elisha Merchant*,

Albany, January 1, 1834.

1000 feet of Pine Boards,	\$10 50
Payable on demand.	

## No. 4. COPY OF ELI GLAZIER'S BILL.

*Mr. Gideon Wealthy,*

Bought of *Eli Glazier*, January 1, 1834.

100 feet of 9 by 7 Glass,	\$15 60
Payable in 60 days.	

## No. 5. COPY OF JOB NAILER'S BILL.

*Mr. Gideon Wealthy,*

Bought of *Job Nailer*, January 1, 1834.

100 wt. Nails, at 11 cents per lb.	\$11 00
Payable on demand.	

No. 6. Bought of *Philip Oysterman*, Jan. 4, 1834.

5000 Oysters, at 50 cent per 100, \$25 00

Paid Cash in full as per Receipt on Bill No. 6.

## INVOICE BOOK No. 1. Page 2.

## No. 7. COPY OF THO. DRY-GOODS' BILL.

*Mr. Gideon Wealthy,*Bought of *Tho. Dry-goods*, Jan. 4th, 1834.

	\$	Cts.
17½ Yards of Broadcloth, at 550 cents		
12 Yards of Satinet, . . . 250		
7 Yards of double milled Drab, 400		
30 Yards of shalloon, . . . 30		
14 Yards of Serge, . . . 200		
27 Yards of Factory Blanketing, 150		
36 Yards of Factory Coating, 125		
	\$	

## No. 8. COPY OF IRA GROCER'S BILL.

*Mr. Gideon Wealthy,*Bought of *Ira Grocer*, Jan. 4, 1834.

5 lb. Green Tea, at 175 cents.		
10 lb. Bohea, . . . 100		
9 lb. Hyson Skin, . . . 125		
4 lb. Pepper, . . . 50		
3 lb. Pimenta. . . . 40		
2 lb. Ginger, . . . 14		
	\$	

## RECEIPT BOOK, No. 1, Page 1.

## No. 1. A GENERAL DISCHARGE.

Received, Albany, 4th January, 1834, of Thomas Silvertown, thirty dollars and fifteen cents, in full of all my demands against him of whatever name or nature.

ANTHONY DISCOUNT.

## No. 2. A DISCHARGE ON ACCOUNTS.

Received, New-York, 4th January, 1834, of Erastus Long, his note for nine dollars and forty-five cents; which, when paid, will be in full of book accounts.

Received by me, JASON GEORGE.

## No. 3, p. 2. FOR RENT.

Received, Albany, 4th January, 1834, of Thurston Paywell and James Industry, twenty-two and a half bush-

els of wheat, in full for rent and all arrearages on Lot No. 204, up to the 2d instant.

Received for S. V. RENSSELAER.  
A. B. C. Agent.

No. 4, p. 3. FOR RENT IN A CITY.

Received, New-York, 3d February, 1834, of K. B. one hundred dollars, in full for the last quarter's rent, due the first instant, of the messuage and tenements he now occupies, situate in Cherry-street.

R. S.

No. 5, p. 4. ON A MORTGAGE.

Received, Westerlo, 5th February, 1834, of G. B. one hundred and fifty dollars, agreed to be in full for principal and interest of the third payment mentioned in a bond and mortgage I hold against him, of Lot number —, situate in the town of Freehold, and county of Greene,

Received by me, R. H.

No. 6, p. 5. RECEIVED FOR ANOTHER PERSON.

Received, Bern, 5th February, 1834, of P. R. sixty dollars, to deliver to T. W. Olcott, cashier of the Mechanics' and Farmers' Bank, at Albany, and am to take his receipt for the same.

Received by me, G. G. L.

#### RECEIPT BOOK, No. 1, Page 2.

When these monies are entered on the Day-Book, always enter the number of the Receipt, and page of the Receipt-Book; thus,

New-York, 3d February, 1834.

R. S. Dr.

To Cash in full for rent, up to the first instant, \$100 00  
Receipt-Book, No. 1, Rec't No. 4, p. 3.

Thus a receipt can always be found readily, when a dispute arises.

#### A NOTE.

Six months after date, I promise to pay George W. or bearer, fifteen dollars and sixty cents, with interest, for value received. Westerlo, 6th March, 1834.

L. M. P.

## ANOTHER.

For value received we promise to pay K. P. ninety dollars, on the 24th day of December next. with interest. Witness our hands at Westerlo, 6th of March, 1834.

W. B. & V. R.

*An expeditious mode of calculating by VULGAR FRACTIONS.*

**Rule 1st.**—Multiply the *Numerator* by the quantity, and divide by the *Denominator*.

**Lesson 1.**—If one bushel of wheat cost  $\frac{3}{4}$  of a dollar, what will 60 bushels cost? Ans. 45 dol.

$\begin{array}{r} 60 \\ 3 \end{array}$	Decimally $\frac{3}{4} = .75$ hundredths.	$\begin{array}{r} 60 \\ 60 \end{array}$
$\begin{array}{r} 4)180(45 \end{array}$	Proof,	$\begin{array}{r} 45.00 \end{array}$

**Lesson 2.**—When one bushel cost  $\frac{3}{5}$  of a dollar; what cost 20 bushels, 30 bushels, 40 bushels?

$\begin{array}{r} 20 \\ 3 \end{array}$	$\begin{array}{r} 30 \\ 3 \end{array}$	$\begin{array}{r} 40 \\ 3 \end{array}$
$\begin{array}{r} 5)60 \\ 12 \text{ dol.} \end{array}$	$\begin{array}{r} 5)90 \\ 18 \text{ dol.} \end{array}$	$\begin{array}{r} 5)120 \\ 24 \text{ dollars.} \end{array}$

**Lesson 3.**—If a yard of cloth cost  $\frac{8}{10}$  of a dollar, what cost 45 yards?

$\begin{array}{r} 45 \\ 8 \end{array}$	Decimally,
$\begin{array}{r} 10)360(36 \text{ dollars.} \end{array}$	$\begin{array}{r} 45 \\ .8 \end{array}$
	Proof,
	$\begin{array}{r} 36.0 \end{array}$

**Rule 2nd.**—Multiply the quantity by the whole number attached to the fraction; then, to that product, add the result of the fraction.

**Lesson 4.**—If 1 bushel cost  $65\frac{3}{4}$  cents, what cost 60 bushels? Ans. 3945 cents.  $65 \times 60 = 3900$ ; 60 at  $\frac{3}{4}$  is the result of the fraction, viz.  $45 + 3900 = 3945$  cts.

**NOTE.**—As this book is intended as an introduction for new beginners in figures; I advise young men, who mean to become proficient in teaching, to purchase the last edition of an Arithmetic, written by DANIEL ADAMS, M. D., and encourage a procurement of it in common schools.

“A word to the wise, is sufficient.”

# POSITION.

Position is called the Rule of False, because we can suppose and take false numbers to reason from, and thereby find the true number sought. This rule is divided into two parts, *single* and *double*.

## SINGLE POSITION.

LESSON 1.—What sum being loaned at 6 per cent. per annum, simple interest, will amount to 1250 dollars in 10 year's time?      Ans. \$781 25. cts.

### RULE.

As the *result* of the supposed number,  
is to the *supposed* number ;  
So is the *given* number,  
to the number sought.

*Operation*.—Suppose we lend 600 dollars at 6 per cent.

600 principal.	36 interest 1 year
6    rate per cent.	10
<hr/>	<hr/>
36 00 interest 1 year.	360 interest for 10 years.
	600 principal.
	<hr/>

960 amount.

Now say—As the amount or result      960 :  
is to its supposed number      600 : :  
So is the given number      1250 :  
to its original true number ;

that is, the principal put to the interest.

Am't. Prin.    Am't.

960 : 600 :: 1250 to a fourth number.

600

960)750000(781.25 answer.

LESSON 2.—The yearly interest of a sum at 6 per cent. is equal to  $\frac{1}{10}$  part of the principal added to 250 dollars ; what is the principal?      Ans. \$25000.

Suppose the principal to be 500 dollars.  
Rate per cent. 6

Interest for 1 year, 30|00  
 $\frac{1}{10}$  of 500 = 25

Excess only, 5 dollars.

Here the excess over  $\frac{1}{10}$  is only 5 dollars interest instead of 250.

Now say, if 5 excess of interest, arises from 500 principal; what did 250 excess arise from?

5 : 500 :: 250 to a fourth number.  
500

5)125000

Ans. 25000

LESSON 3.—Of a certain sum lent, I received one fourth, one fifth, and one sixth, which amounted to 185 dollars; what was the sum lent?

Answer, 300 dollars.

Suppose I lent 60 dollars. 37 : 60 :: 185  
 $\frac{1}{4}$  = 15 185  
 $\frac{1}{5}$  = 12  
 $\frac{1}{6}$  = 10 37)11100(300 Ans.  
111  
Result, 37 ... 00

LESSON 4.—A and B have a salary each alike for 3 years; A saves  $\frac{1}{3}$  of his wages, but B spends the whole of his and one third more, falls in debt 50 dollars yearly, and at the end of 3 years after settling his accounts, has only 20 dollars left of a present given by his uncle at the commencement of business; what was the salary? And how much the present?

Answer, the salary was 150 dols. each.

The present was 170 dollars to B.



*Operation.*

Suppose the salary to be 6 dols. Result. Pos. Result.

The third of 6 = 2      2 : 6 :: 50

B spends 50 dollars a year      50

more than his salary for three

years = 150 dol. and 20 he

had left = 170 the present.

2)300(150 Sal.

## LESSON 5.

On the 29th day of August, 1834, I find by ancient records, that my birth-day will be on the 25th of October next; when, if alive, multiply my age by 8, and divide the product by 4, and that quotient by 2, then add the product and the two quotients, their sum total will make 869. What will be my age?

Ans. 79 years.

Suppose 36

396 : 36 :: 869 : 79

8

4)288

2)72

36

396

LESSON 6.—Says George to Harry, I have a sum of money to buy books; the  $\frac{1}{3}$  and  $\frac{1}{2}$  a  $\frac{1}{3}$  of which will make 4 dollars and 50 cents; if you will tell me how much I have, 2 dollars shall be yours.

Answer, 9 dollars.

Suppose 12 dollars.

R. P. R.

The  $\frac{1}{3}$  of 12 = 4

6 : 12 :: 4.50

The  $\frac{1}{2}$  of 4 2

12

Result, 6

6)54.00

Answer, 9.00

## DOUBLE POSITION,

Is when we use two suppositions: and if we miss in both, observe the nature of the errors and work accordingly. When the errors are both less, or both greater than the given number, they are alike; but if

one be greater and the other less than the given number, they are unlike.

**RULES.**—1. When the errors are *alike*, take their difference for a divisor, and the difference of their products for a dividend.

2. When the errors are *unlike* take their sum for a divisor and the sum of their products for a dividend.

**LESSON 7.**—A B and C would divide 250 dollars between them in such manner that B may have 7 dols. 50 cents more than A, and C 10 dols. more than B; how much must each man have?

Ans. A must have 75 dols. B, 82.50 and C, 92.50.

*Operation.*

1st. Suppose A,	20	2nd. Suppose A,	40
B,	27.50	B,	47 50
C,	37.50	C,	57.50

Result,	85.00
Given number,	250.

Result,	145.00
Given number,	250.

1st Error,	165	2nd. Error,	105
------------	-----	-------------	-----

Having proceeded according to the proportions mentioned in the question, and placed the suppositions and errors as here represented, multiply them crosswise, that is multiply the first error by the last supposition, and the last error by the first supposition.

Supposi. Error.

1st. 20 X 165

2nd. 40 X 105

First error, 165

Last supposi. 40

First error,	165
Second,	105

1st product,	6600
Second error,	105
First Supposi.	20

Difference,	. 60 for a divisor.
First product,	6600
Second,	2100

2nd. Product,	2100
6 0)450 0	

Dividend,	4500
-----------	------

75.	A's part.
82.50	B's.
92.50	C's.

Proof, 250.00

Aa

**LESSON 8.**—"A saddle is worth 50 dollars: two horses are of different value: when the saddle is on the first horse it raises his value to double the second; but when it is on the second horse, his value is triple the first: What is the value of each horse?"

**Ans.** The price of the first horse is 30 dollars, and the second 40."

*Operation.*

1st. Suppose the first horse worth,	38 dol.
The saddle,	50
	<hr/>
Their combined value,	88
	<hr/>
The price of the second horse $\frac{1}{2}$ of 88 =	44
The saddle,	50
	<hr/>
Their combined value,	94
3 times the value of the 1st horse $38 \times 3 =$	114
	<hr/>
The difference between 114 and 94 is the first error,	20
2nd. Suppose the first horse worth,	42 dol.
The saddle,	50
	<hr/>
Their combined value,	92
	<hr/>
The price of the second horse $\frac{1}{2}$ of 92 =	46
The saddle,	50
	<hr/>
Their combined value,	96
Three times the value of the first $42 \times 3 =$	126
	<hr/>
The difference between 126 and 96 is the second error,	30

Supposi. Error.

1st. 38  $\times$  20  
2nd. 42  $\times$  30

First supposition, 38

Last error, 30

First product, 1140

Second supposition, 42

First error, 20

Second product, 840

First product, 1140

Dividend, 300

First error, 20

Second, 30

Diff. or divisor, 10

10)300

30 first horse.

50 saddle.

80 saddle & horse.

40 second horse.

50 saddle.

90 saddle & horse

three times the  
value of the 1st.

LESSON 9.—“A boy stealing apples being taken by mad Tom, gave over half he had stolen, and Tom gave him back 10; in his return home, he was met by raving Ned, who took from him one half of what he had left, and returned him back 4; after that, unluckily, positive Jack meets him, and takes away one half the remainder, giving back 1; at last, getting safe away, he finds he has 18 left: How many had the boy at first?  
Answer, 100.”

1. Suppose 124

Tom took 62

Gave back 10

Leaves 72

Ned took 36

Gave back 4

Leaves 40

Jack took 20

Gave back 1

Leaves 21

Given number 18

1st error 21—18= 3

2. Suppose 148

Tom took 74

Gave back 10

Leaves 84

Ned took 42

Gave back 4

Leaves 46

Jack took 23

Gave back 1

Leaves 24

Given number 18

2nd error 24—18= 6

Supposi. Error.

1st. 124  $\times$  32nd. 148  $\times$  6

744 first product.

444 2nd. product.

Diff. of errors, 3	$\div$ by 3.	300 difference.
		100 Answer.



## USEFUL EXERCISING LESSONS.

1. Suppose I gave a Note on the first day of December 1833 for the sum of \$34.50, payable in one month; on the first of April 1834 paid \$13.25; on the first of July following paid 12.50; then agreed with the holder to pay in full on the first of October, 1834. What will be my last payment allowing 7 per cent.?

NOTE:—*When no interest is mentioned in the Note, it will draw interest from the time promised to pay.*

RULE, for calculating lawful interest, as decided by Chancellor Kent: *See Johnson's Chancery Reports of New York*, Vol. 1 p. 17.

CONNECTICUT *v.* JACKSON.

When part payments have been made, apply the payment in the first place, to the discharge of the interest then due. If the payment exceeds the interest, the surplus goes towards discharging the principal, and the subsequent interest is to be computed on the balance of principal remaining due. If the payment be less than the interest, the surplus of interest must not be taken to augment the principal; but interest continues on the former principal until the period when the payments, taken together, exceed the interest due, and then the surplus is to be applied towards discharging the principal; and interest is to be computed on the balance of principal as aforesaid."

In the settlement of accounts, if interest be cast on interest or by compound interest, it is unlawful; but



there are three cases mentioned in said Report, where interest on interest is legal : First, where parties make a subsequent contract respecting certain sums of principal and interest that are due ; secondly when parties make a settlement of their accounts, by adding principal and interest together for a new principal ; and thirdly, when a Master's Report, computing the amount of principal and interest, has been confirmed by the Chancellor.

### A SECRET FOR TEACHERS.

#### 2. *How to know with one glance of the eye, the true amount of any sum in Addition.*

The Teacher will set the sums himself in couplets after the following manner.

4562	}	First couplet.
5437		
1234	}	Second couplet.
8765		
4567	}	Third couplet.
5432		
1463		A half couplet.

---

31460 Amount.

In the first place observe, that when the members of each couplet are added together, their amount will make 9999, then observe how many couplets there are ; - in this case say 3 ; subtract 3 from the right hand figure in the half couplet, and at the same instant place 3 on the left of the whole, and bring down the residue of the said half couplet, viz. 1, 4, 6 ; then the amount will stand thus, 31460. This rule will hold good in all the various denominations ; as, pounds, shillings, pence, farthings ; hundreds, quarters, pounds, ounces, &c. : Only observe, that, each couplet contains one less than the number in that de-

*nomination*: That is to say, in whole numbers, 9; in shillings, 19; in pence, 11; in farthings, 3;—For Avoirdupois weight, in quarters 3; in pounds, 27; in ounces, 15; in drams, 15, &c. &c.

## EXAMPLE.

£44	16	8	2	} First couplet.
55	3	3	1	
14	14	5	3	} Second couplet.
85	5	6	0	
41	15	5	3	A half couplet.

---

£241 15 5 1

In this last example we say, there are 2 couplets; and the right hand figure is 3; then 2 from 3 and 1 remains; set the 1 under 3 and carry 2 to the left of the whole: bring down the residue of the half couplet, and the amount will stand thus; £241 15s. 5d. 1q.

3. If 365 days will make one year, how many days are in 76 years and 256 days? Ans. 27996.

4. General La Fayette, Co-Patriot with General Washington, was born September 6th, 1757—died May 20th, 1834. What was his age?

5. In a field 60 rods square how many acres? Ans. 22½.

$60 \div \text{by } 4 = 15 \text{ ch. } 00 \text{ links: } 15.00 \times \text{by } 15.00 = 2250000 \text{ links; now cut off five decimals at the right; the left will be acres. Thus, } 22.50000.$

6. How much carpeting 3 qrs. wide will cover a floor 18 feet long and 16 feet wide?

Answer, 42 yds. 2 qrs. 6 inches."

$18 \times 12 = 216$  inches in length;  $16 \times 12 = 192$  in width; and  $3 \text{ qrs. } \times 9 = 27$  inches in width. Now say, as 27 in width are to 192 in width; so are 216 in length to a fourth number, viz. 42 yds. 2 qrs.

6 in.  $27 : 192 :: 216$ . See page 201, where Inverse proportion is made direct in all cases.

7. How many shingles, 4 inches wide, will cover a roof 40 feet long with 30 feet rafter, allowing each course to gain 6 inches? Ans. 14400."

*Note.*—We may add 240 shingles to form a double course over the eaves.

8. *Proof of Lesson 6.* How many superficial square inches in a piece of carpeting 42 yds. 2 qrs. and 6 inches? Ans. 1536 inches.

9. What will be the price of 72 yards of cambric, of which 9 yards cost £5 12s.? Ans. £44 16s.

yds.	£.	s.	yds.	£.	s.
9	:	5	12	:	72 : 44 16

Multiply the second term by 8, the product will be the answer; because any number multiplied by 8, will produce the same result as if it were multiplied by 72, and that product divided by 9.

"10. What will 9 yards of cambric cost at the rate of £44 16s. for 72 yards? Ans. £5 12s."

Divide the second term by 8, the quotient will be the answer. 72 yds. : £44 16s. :: 9 yds. : £5 12s.

"11. How many men must be employed to finish a piece of work in 15 days, which 5 men can do in 24 days? Ans. 8 men."

See page 201.

"12. A garrison being besieged, has 5 months' provisions in it, at the rate of 12 ounces a day for each man; but being informed that it cannot be relieved till after 9 months, how much per day must each man have that the provisions may last that time?

Answer  $6\frac{2}{3}$  oz."

"13. What will the tax be on £763 15s., at the rate of 3s. 6d. per pound? Ans. £133 13s. 1½d."



"14. What will 7 cwt. 1 qr. of sugar cost, at the rate of 43 cwt. 2 qrs. for £159 2s.?"

See page 177.

Ans. £26 10s. 4d."

"15. A person stopping payment, owes to several £977, but compounds with them for 8s. 7½d. per pound; what must he pay them in all?"

Ans. £420 6s. 3½d."

"16. What must be given for 7 cwt. 3 qrs. 14 lb. cheese, at £1 14s. 2d. per cwt.?"

Answer, £13 9s. 0½d."

"17. If the tax on £763 15s. be £133 13s. 1½d. at what rate is it per pound?"

Answer, 3s. 6d."

"18. What will the transportation of 8 cwt. 3 qrs. 7 lb. cost, at the rate of 10d. per stone of 14 lb.?"

Answer, £1 18s. 9d."

"19. What must be paid for 73 pieces of lead, each weighing 1 cwt. 3 qrs. 7 lb., at £10 4s. per fother of 19½ cwt.?"

Ans. £69 4s. 2d. 148q."

"20. If 5 yards of cloth cost 14s. 2d., what must be given for 9 pieces containing each 21 yds. 1 qr.?"

Ans. £27 1s. 10½d."

*To make a Hopper to hold any given quantity, having the depth given.*

**RULE.**—Divide the inches contained in the bushels it is to hold, by one third of the depth in inches; the quotient will be the square of one of the sides at top. Extract the root of that square for the length of one side.

### EXAMPLE.

21. "The hopper shall hold 6.5625 bushels, the given depth is 24 inches, how long must be one side at top?"

Ans. 42 inches."

# RECIPE FOR INK.

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## *Operation.*

The number of bushels in the hopper, 6.5625

The number of inches in a bushel, 2150.4

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262500

3281250

65625

131250

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One third the depth  $\div 8$ ) 14112.00000

$\sqrt{1764.}$  (42 Ans. in

16 [inches,

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82). 164

164

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## RECIPE FOR MAKING GOOD INK.

“Take 8 ounces of Nutgalls, 4 ounces of ground or rasped Logwood, and boil them one hour in 12 pounds of water, or until one half is evaporated ; it is then percolated, or strained through a hair sieve, and to this liquid are added sulphat of iron or copperas 4 ounces, gum Arabic 3 ounces, and sulphat of copper or blue vitriol one ounce.\* This solution is well stirred and suffered to stand twenty-four hours ; it is then poured off from the sediment and kept close stopt in glass or stone jars.” See *Encyclopedia* under CHEMISTRY.

\* *Note.*—The original Recipe orders 1 ounce of sugar candy ; but I find it too glutinous for expeditious writing ; though it gives a beautiful gloss in school copies. Mr. Sylvester in Albany, prepares an excellent Ink-powder.

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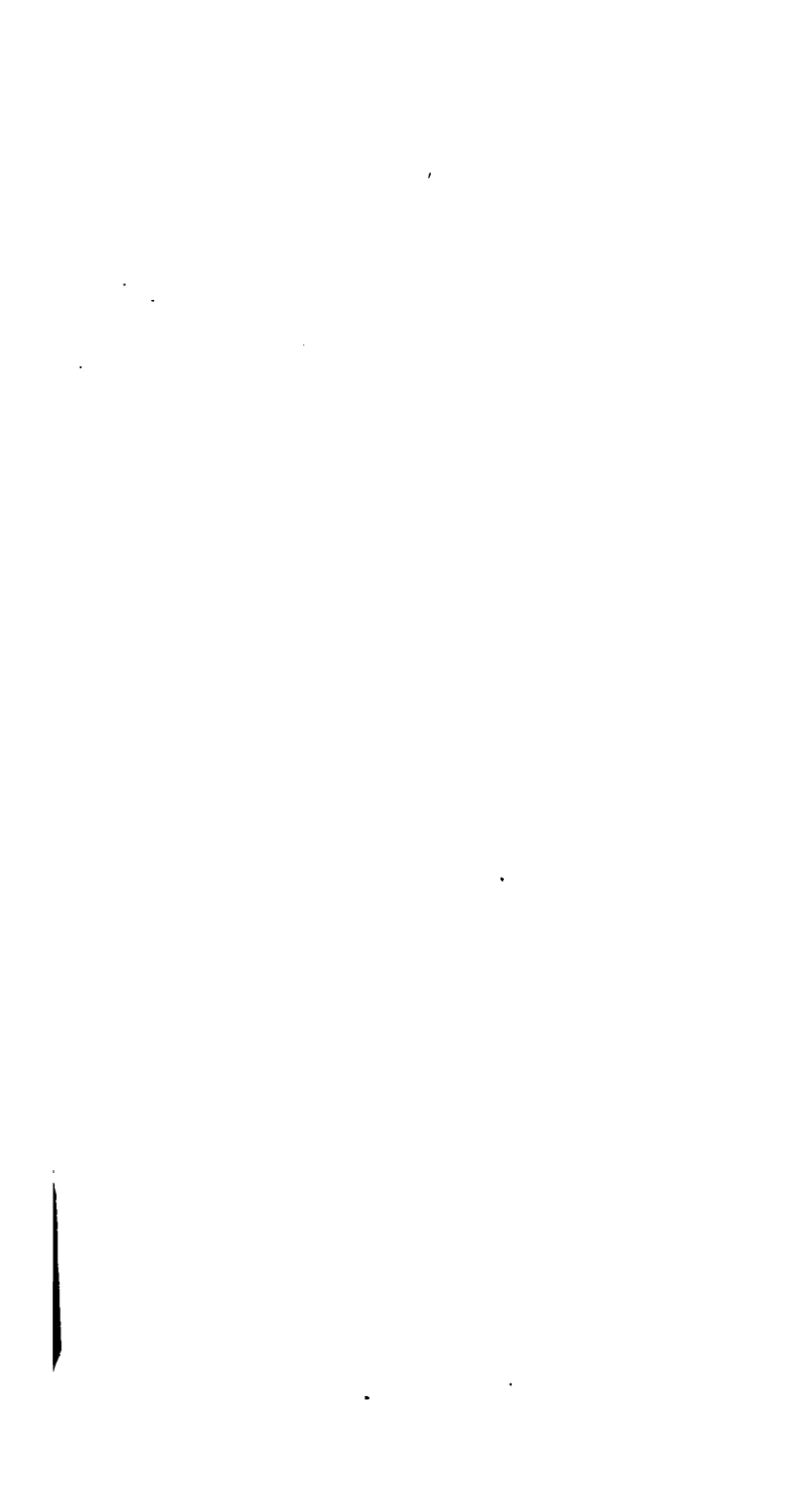
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**ERRATUM** —Page 187, multiply 25.96728750 by 1.08. Reject the period between 5 and 0.

**THE END.**

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72











1000

1

